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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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79-2001. Hrnciar, P.; Lacova, M. (Chair Org. Chem., Fac. Nat. Sci., Univ. Komenskeho, Bratislava, CSSR) **Pesticidy a zivotne prostredie. [Pesticides and life environment.]** *Acta Fac. Rerum Nat. Univ. Comenianae Form Prot. Nat.* 3: 79-87; 1978. (9 references) (Slovak)

The criteria used in assessing acute and chronic toxicity to warmblooded animals are discussed. The relationship between the structure and biological activity, accidental screening, logical application, changing the structure of a substance with known characteristics, and detection of lost characteristics, when characteristics of a newly synthesized compound differ from those expected, are considered. The procedure is tested on seed disinfectants containing cyclic *S* diketones, organophosphorus insecticides and 3-aroxymethylene phthalimide herbicides. An integrated assessment of the effects of pesticides on crops and animal metabolism is needed to draw up guidelines for their application.

79-2002. Boden, A. (Hardman Chemicals Pty. Ltd., Sydney, Australia) **Industrial and social risks associated with pesticides.** *Chem. Aust.* 46(3): 93-97; 1979.

The risks taken when pesticides are employed, and the need for the use of these chemicals are considered. Specific topics mentioned include the detecting and measuring of the amount of DDT in human food, the use of DDT in efforts to combat malaria, and resurgence of this disease after bans on the use of DDT went into effect. Risks involved in the use of 2,4,5-T with particular mention of genetic defects occurring in areas where 2,4,5-T had been sprayed are discussed in detail. Dioxin (TCDD) is noted as being highly toxic in animal tests with the production of deformities in newly born mice. The presence of dioxin as an impurity formed during the manufacture of 2,4,5-T and methods for removing this impurity are listed. Special care required during the use of handling of organophosphates is stressed. The use of sex attractants in the fight against insects is also mentioned.

79-2003. Subramanian, B. R.; Lingaraja, T.; Venugopalan, V. K. (Cent. Adv. Study Mar. Biol., Porto Novo 608502, India) **Effect of low concentrations of DDT on the growth and production of marine diatom *Skeletonema costatum* (Grev).** *Curr. Sci.* 48(5): 226-228; 1979. (7 references)

One ml stock cultures, containing approximately 81,000 cells of the marine alga *Skeletonema costatum*, were added to culture media containing 1 to 20 ppb DDT. Growth and multiplication of cells receiving 1 ppb DDT were identical to those of controls, but marked reductions in cell numbers were noted at DDT concentrations above 4 ppb. Primary productivity started to decline above 2 ppb DDT and was completely inhibited at DDT levels of 15 ppb. Growth inhibition and productivity were proportional to the concentration of the pesticide. From these findings it was concluded that *S. costatum* could be used as an indicator species in pollution monitoring studies.

79-2004. Suhasini, D.; Rajendra, W.; Indira, K.; Swami, K. S.* (Dep. Zool., Sri Venkateswara Univ., Tirupati 517502, India) **DDT impact on asparatate and alanine amino transferase activity levels in the liver of frog, *Rana hexadactyla*.** *Curr. Sci.* 48(5): 228-230; 1979. (20 references)

The *in vitro* effects of DDT on the enzyme systems of frog livers involved in amino acid metabolism were investigated. Livers of *Rana hexadactyla* were homogenized and incubated with 2 to 29 μM DDT in 0.01 to 0.1 ml sucrose solutions. Sucrose-soluble protein, and structural protein contents of the livers increased by 342 and 116%, respectively, while free amino acid contents decreased (64% at 20 μM DDT) at elevated DDT concentrations. Asparatate (AAT) and alanine (AlAT) amino transferase activities of the liver homogenates showed a continuous elevation with increased DDT concentrations up to 14 μM DDT. These activities decreased at higher pesticide concentrations. The results suggest that DDT causes induction of drug-metabolizing enzymes in the liver, and leads to marked changes in the protein-synthesis system.

79-2005. Anonymous **EPA suspends the major uses of two herbicides.** *Environ. Sci. Technol.* 13(6): 640-641; 1979.

When the increased incidence of miscarriages in the Alsea, Oregon area was correlated with spray programs involving 2,4,5-T, the US EPA ordered a temporary emergency suspension of the use of 2,4,5-T and a similar herbicide, silvex. The contaminant of these herbicides, TCDD, was seen as the cause of dangers in these compounds even when present at levels as low as 0.1 ppm. The Dow Chemical Company, the main producer of 2,4,5-T, argued that the ban was unfounded because evidence of a cause-effect relationship between increased miscarriages and use of 2,4,5-T has not yet been uncovered. Studies are now underway to study soil, water, game meat and human milk samples from the Alsea basin for evidence of TCDD. A computerized case history study of Vietnam veterans and their families is also being conducted to test for alterations in human white blood cells and antibodies that could have resulted from exposure to Agent Orange (containing 2,4,5-T) during the war. Should positive evidence from these studies turn up, then the EPA would have a firm agrument for cancelling the registration of 2,4,5-T.

79-2006. Lynch, M.; Weiner, E. (Waters Associates, Milford, MA 01757) **HPLC: high performance liquid chromatography.** *Environ. Sci. Technol.* 13(6): 666-671; 1979.

A review is given of the multiple uses of HPLC for determining various pollutants in environmental samples. HPLC can be used to determine mixtures of pollutants in samples of air, soil, water, and numerous other environmental systems. It s particularly useful for monitoring contaminants such as benzo(a)pyrene in the air of the workplace environment. Isocyanates in industrial atmospheres may also be monitored by HPLC techniques. The highly toxic and persistent pesticide, PCP, is also detected in the effluents of pulp and paper mills by this analytical technique. The basic operation of an HPLC system as well as the usual steps involved in sample preparations are given. The advantages of an HPLC system for the monitoring of industrial wastewaters and agricultural run-off waters are also discussed.

79-2007. Shitskova, A. P. (Author address not given) **Gigienicheskie aspekty profilaktiki serdechno-sosudistykh zabolevanii. [Hygienic aspects of prophylaxis of cardio-vascular diseases.]** *Gig. Sanit.* 44(3): 3-5; 1979. (14 references) (Russian)

Various factors in the etiology of cardio-vascular pathology are discussed. Special attention is given to the effect of environmental pollution by agricultural chemicals. Analysis of literature data revealed that pesticides have a broad spectrum of humoral effects on the cardio-vascular system. Experiments with a new carbamate pesticide, 275 showed marked changes in the electrocardiogram. Animals developed tachycardia and disorders in oxidative phosphorylation.

79-2008. Tkach, L. I. (All-Union Res. Inst. Hyg. & Toxicol. Pestic. Polym. & Plast., Kiev. USSR) **Otklik na stat'iu kand. Med. nauk A. Ia. Iakubova 'K voprosu o zonirovanii pestitsidnoi opasnosti i urovnei zabolevaniia v raznykh zonakh'. [Reply to an article 'Zoning of the degree of pesticide risk and level of morbidity in various zones'.]** *Gig. Sanit.* 44(3): 55-57; 1979. (2 references) (Russian)

A critical review of a previous article (*Pesticide Abstracts* 77-2610) on relationships beween the overall morbidity of the population on one hand and pesticide use and climatic conditions on the other hand is presented. The zones of observation were selected incorrectly, and therefore the overall morbidity appeared to be higher in the control population (in the zone with reduced pesticide use) than in the experimental group. It was incorrectly concluded that only the incidences of diseases of the gastrointestinal tract, liver, and respiratory system should be taken into account when assessing the hazards of pesticides. It was assumed that other classes of diseases were subject to too many other factors. Experience in such epidemiological investigations has, however, shown that there are substantial differences not only in the incidence of specific classes of diseases but also in the overall mortality between different climatic zones with sufficiently great differences in pesticide use.

79-2009. Pivovarov, Iu. P.; Omel'ianets, T. G. (N. I. Pirogov Med. Inst. II, Moscow, USSR) **Primenenie mikrobnykh preparatov dlia zashchity rastenii ede aktual'naia gigienicheskia problema. [Use of microbial pesticides as an important hygienic problem.]** *Gig. Sanit.* 44(4): 15-18; 1979. (Russian)

Various hygienic aspects of the use of microbial preparations developed for the control of pests, rodents and pathogens of plant diseases are discussed. For safety precautions the microorganisms should not be natural human pathogens. Microorganisms such as *Salmnella enteriditis* can increase the incidence of salmonellosis and can not be used against rodents. *Pseudomonas aeruginosa,* which can cause sepsis, and inflammatory diseases of the respiratory and urogenital systems, can not be used for plant protection.

79-2010. Perrelli, G.; Pettinati, L. (Catt. Med. Prevent., Univ. Torino, Torino, Italy) **Epatopatie tossiche professionali. Orientamenti exiopatogenici e diagnostici attuali. [Occupational toxic hepatopathies. Modern etiopathogenic and diagnostic features.]** *Minerva Med.* 70(13): 909-918; 1979. (33 references) (Italian)

The etiopathogenesis and diagnosis of occupational liver aliments are reviewed. The biochemical modifications, such as enzymatic changes, effect on the microsomal respiratory system, and biotransformation of toxic substances, are described and the principal industrial hepatotoxic substances are listed. The pathogenic effect is due to 3 mechanisms; the effects on the bilirubin mechanism, direct liver damage to cellular and subcellular structures, and sensitization. Inorganic substances causing liver damage include many metal salts but prime inducers are the phosphorus-containing rodenticides. Organics, such as halogenated aliphatic hydrocarbons, aldehydes, ketones, alcohols and glycols and halogenated derivatives of aromatic and cyclic hydrocarbons, are also responsible for liver damage. There is unfortunately no quick specific diagnostic method for detemining toxicity from small doses of hepatotoxic agents but examination of the hepatobiliary function may be useful.

79-2011. Agarwal, A. (Author address not given) Pesticides resistance on the increase, says UNEP. *Nature (London)* 279(5711): 280; 1979.

The problems of insect resistance to chemical pesticides and alternative pest control devices are discussed. Studies have confirmed that the number of insect species that are resistant to particular pesticides, such as DDT and malathion, have increased over time. Laboratory investigations involving artificial selection have illustrated pest resistance to numerous other compounds. Mosquito populations have developed resistant strains in countries that use malarial spray programs. The costly testing of pesticides for safety factors have left the manufacturers of these chemicals hesitant to develop new products to replace existing formulations to which insect pests have become resistant. Houseflies have exhibited resistance to a great variety of pesticidal compounds over a wide geographic range. It was believed that novel alternatives to chemical methods of pest control might offer less chances for the development of resistance. Methods such as hormone regulators, chemical sterilants, and biological control agents have not yet been used extensively enough to determine whether insects will develop resistance to their actions or not. Integrated pest management programs are being advocated to help alleviate the problem of insect resistance that often occur in single chemical control programs.

79-2012. Tontis, A. (Inst. Tierpathol., Univ. Bern, Bern, Switzerland) **Zur Pathologie der chronischen Kupfervergiftung beim Schaf. [Pathology of copper poisoning in sheep.]** *Schweiz. Med. Wochenschr.* 109(10): 367; 1979. (German)

The chronic poisoning of 11 ewes following repeated intake of cattle feed containing copper, which due to a cumulative effect killed all of the animals, is described. The

animals exhibited apathy, anorexia and were immobilized. The cause was established by quantitative analysis of liver tissues. Autopsy revealed a massively enlarged liver of yellowish-greenish color containing numerous reddish foci, swollen kidneys of metallic color and coffee-brown urine. Other organs exhibited multiple small hemorrhages. Similar toxic accidents can occur as a result of repeated ingestion of copper-containing veterinary drugs, insecticides, anthelmintics and fertilizers.

79-2013. Sweeney, G. D.; Jones, K. G.; Cole, F. M.; Basford, D.; Krestynski, F. (Dep. Med., McMaster Univ., Hamilton, Ontario L8S 4J9, Canada) **Iron deficiency prevents liver toxicity of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin.** *Science* 204(4390): 332-335; 1979. (3 references)

The compound 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) causes hepatocellular damage and porphyria in C57Bl/6J mice, among a wide range of toxic effects. We compared the effect of TCDD toxicity in iron-deficient mice with that in mice receiving a normal diet. Porphyria did not develop in the iron-deficient animals, and these animals were also protected from hepatocellular damage and certain other toxic effects of TCDD. (Author abstract by permission. Copyright 1979 by the American Assoc. for the Adv. of Sci.)

79-2014. Bababunmi, E. A. (Dep. Biochem., Univ. Ibadan, Ibadan, Nigeria) **The problem of environmental carcinogens in tropical Africa.** *Toxicol. Appl. Pharmacol.* 48(1): A152; 1979.

The incidence of primary liver cancer in the countries of tropical Africa is the highest in the world. There is a growing belief that the relatively high prevalence of hepatocellular carcinoma in some West and East African states may have a multiple chemical factor etiology in such forms as food contaminants, herbal teas and environmental chemicals. Chemical carcinogens identified in the environment include aflatoxin, *N*-nitroso compounds, pyrrolididine alkaloids, cyclamate, cycasin and DDT. Palmotoxin, a fungal contaminant of a local palm wine, can induce mutation in bacteria. There are other sources of potential carcinogens that are introduced by humans or occur maturally in such areas. With the arrival of various industries and foreign technology in African countries, and modernization of their big cities, atmospheric pollutants and narcotics present a new danger. There is a need to stimulate more research into the special toxicological problems that are peculiar to people living in the tropical areas of Africa. [Abstract #304 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2015. Seefeld, M. D.; Yang, K. H.; Peterson, R. E. (Sch. Pharm., Univ. Wisconsin, Madison, WI) **Effects of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin on liver function in rats, rabbits and guinea pigs.** *Toxicol. Appl. Pharmacol.* 48(1): A153; 1979.

A single dose of 2,3,7,8- tetrachlorodibenzo -*p*- dioxin (TCDD) was given to male rats (25 μg/kg, po), rabbits (25 μg/kg, ip) and guinea pigs (2 μg/kg, ip) and liver function assessed 10 days later. Control animals received acetone/corn oil. In TCDD-treated rats blood clearance of ouabain was decreased while indocyanine green (ICG) clearance was unaltered. The serum level of sorbitol dehydrogenase (SDH) was elevated but those of glutamic pyruvic transaminase (SGPT) and γ glutamyl transpeptidase (GGTP) were not. Bile flow, bile salt excretion and bilary erythritol clearance were all reduced by TCDD and body weight was decreased 8% 10 days after treatment. In rabbits ouabain blood clearance was unaltered by TCDD treatment while clearance of ICG was greatly reduced. SDH and SGPT activities were elevated while GGTP activity remained unchanged. By day 10 body weight of TCDD-treated rabbits had dropped 2%. TCDD treatment in guinea pigs did not alter ICG clearance or SDH, SGPT and GGTP activities although a 35% reduction of body weight had occurred. Taken together these results show a variation between species in both the susceptibility to and in the nature of the hepatotoxic response to TCDD. [Abstract #306 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2016. Seefeld, M. D.; Peterson, R. E. (Univ. Wisconsin, Madison, WI) **Time course of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) effects on liver function in rhesus monkeys.** *Toxicol. Appl. Pharmacol.* 48(1): A160; 1979.

Blood clearance of indocyanine green (ICG) and serum levels of sorbitol dehydrogenase (SDH), γ glutamyl transpeptidase (GGTP), and glutamic pyruvic transaminase (SGPT) were assessed at weekly intervals in male monkeys treated with a single oral dose of TCDD: 75 μg/kg (n=1), 25 μg/kg (n=2) and 5 μg/kg (n=1); control animals received acetone/corn oil. The monkeys given 75 or 25 μg/kg exhibited periorbital edema, loss of body and facial hair, acneform eruptions, and a substantial weight loss with a moribund state occurring 4-6 wk after treatment. In these animals ICG clearance increased during the first few weeks following treatment but then declined steadily until death. SDH and SGPT were elevated in all debilitated animals while GGTP was variable. The animal given given 5 μg/kg showed some hair loss and a moderate decrease in weight which returned to normal after 13 wk. ICG clearance also changed biphasically but the magnitude of change was less. All serum enzymes were elevated at some time during intoxication. Thus, acute TCDD treatment first increases and then decreases ICG clearance and elevates serum enzymes to varying degrees at different times after treatment. [Abstract #320 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2017. Ramsay, J. C.; Hefner, J. G.; Karbowski, R. J.; Braun, W. H.; Gehring, P. J. (Toxicol. Res. Lab., Dow Chem. Co., Midland, MI 48640) **The *in vivo* biotransformation of 2,3,7,8-tetrachlorodibenzo- *p*- dioxin (TCDD) in the rat.** *Toxicol. Appl. Pharmacol.* 48(1): A162; 1979.

This study presents evidence for the *in vivo* biotrans-

formation of TCDD in the rat. Three male rats were implanted with indwelling bile loop cannulas. They were then given daily oral doses of 15 μg ^{14}C-TCDD per kg. After 2, 4, or 6 doses, the bile loop of one rat was opened and bile was collected for 24 hr. Biliary ^{14}C in the feces of rats fed similar to the excretion of ^{14}C in the feces of rats fed ^{14}C-TCDD in a previous study. Selective solvent extraction revealed that the biliary ^{14}C activity was due to compounds more polar than TCDD itself. Incubation of bile with β-glucuronidase resulted in the extraction of more ^{14}C activity, implying the presence of glucuronide conjugates of ^{14}C-TCDD metabolites. Liquid chromatography of bile has revealed the presence of at least 5 distinct radioactive peaks, none of which was due to ^{14}C-TCDD. The data did not indicate extensive enterohepatic circulation of radioactivity derived from ^{14}C-TCDD. These results, in conjunction with the results of previous studies, indicate that TCDD is slowly metabolized in the liver to a variety of polar metabolites, which are then excreted in the bile. [Abstract #325 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2018. Nolan, R. J.; Smith, F. A.; Hefner, J. G. (Toxicol. Res. Lab., Health & Environ. Res., Dow Chemical Co., Midland, MI 48640) **Elimination and tissue distribution of 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD) in female guinea pigs following a single oral dose.** *Toxicol. Appl. Pharmacol.* 48(1): A162; 1979.

The distribution and excretion of ^{14}C-labeled TCDD in guinea pigs was studied to determine if differences in these parameters might explain reported differences in species sensitivity to TCDD. ^{14}C-labeled TCDD was administered by gavage. The guinea pigs were sacrificed in groups of 3-5 animals each at 1, 2, 6, 12 and 22 days after dosing and samples of the major tissues, bile, plasma, urine and feces were analyzed for radioactivity. Only half of the dose was absorbed. Twenty-two days after dosing, the fat, liver, adrenals and thymus contained 0.75 ± 0.17, 0.40 ± 0.14, 0.33 ± 0.08, and 0.72 ± 0.08% dose/g, respectively. The remaining tissues, plasma, urine and bile did not consistently contain measurable amounts of radioactivity. Based on the clearance of radioactivity from the fat, liver and adrenals, the half life for the elimination of TCDD in guinea pigs was estimated to be between 22 and 43 days. The data suggest that differences in tissue distribution may contribute to the reported differences in species sensitivity to TCDD. [Abstract #325 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2019. Allen, J. R.; Van Miller, J. P.; Barsotti, D. A.; Carstens, L. A. (Dep. Pathol., Med. Sch., Univ. Wisconsin, Madison, WI 53706) **Toxicological responses of nonhuman primates to 2,3,4,6,7,8-hexachloro dibenzo-*p*-dioxin (HCDD).** *Toxicol. Appl. Pharmacol.* 48(1): A179; 1979. (1 reference)

Male juvenile rhesus monkeys were fed a diet containing 5 ppb of 2,3,4,6,7,8-HCDD for 6 mo. During this period the animals consumed approximately 135 μg of HCDD. By the third month of exposure there was congestion and swelling of the eyelids and loss of eyelashes that became more severe with time. By the sixth month, the animals had difficulty seeing due to the swelling of the eyelids and marked occular discharge. There was also loss of hair, which was obvious by the fourth month, and extended over the entire body the the sixth month. Intermitant periods of vomiting and diarrhea occurred from the fourth to the sixth month. Anemia and leukopenia were apparent in the animals by the sixth month. Similar signs and lesions have been reported to occur in monkeys fed 500 ppt 2,3,7,8-tetrachlorodibenzo -*p*-dioxin (TCDD). Indications are that TCDD is approximately 10 times more toxic than HCDD to rhesus monkeys when the exposure occurs over an extended period. [Abstract #359 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2020. Schantz, S. L.; Barsotti, D. A.; Allen, J. R. (Dep. Pathol., Med. Sch., Univ. Wisconsin, Madison, WI 53706) **Toxicological effects produced in nonhuman primates chronically exposed to fifty parts per trillion 2,3,7,8-tetrachlorodibenzo -*p*-dioxin (TCDD).** *Toxicol. Appl. Pharmacol.* 48(1): A180; 1979. (1 reference)

Adult female rhesus monkeys were fed a diet containing 50 ppt TCDD for 20 mo. Prior to TCDD exposure to animals had normal hemograms, serum chemistry and serum estradiol and progesterone. After 7 mo on the TCDD diet (total TCDD intake 0.35 μg/kg body wt.) attempts were made to breed the females to control rhesus males. There were 4 abortions and 1 stillbirth. Two of the animals were bred on repeated occations and did not conceive. The remaining 2 animals were able to carry their infants to term. All of the 8 control animals conceived and gave birth to normal infants. During the 20 mo of exposure to TCDD (total intake of 0.9 mg/kg body wt.) the animals experienced hair loss, hyperkeratosis particularly of the arms, and weight loss. There was also been a decrease in serum cholesterol, hematocrits and white blood cells and an increase in serum glutamic pyruvic transaminase. The above changes were similar to but not as severe as those experienced by rhesus monkeys fed a diet containing 500 ppb TCDD. [Abstract #360 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2021. Reggiani, G. (Med. Res. Board, F. Hoffmann La. Roche & Co. Ltd., Basel, Switzerland) **TCDD contamination in Italy: the risk assessment of low level exposure, cumulative effect and long-term consequences.** *Toxicol. Appl. Pharmacol.* 48(1): A180; 1979.

On July 10, 1976, a runaway reaction in a plant producing trichlorophenol caused contamination of 726 acres of land and populated area at a level of TCDD of 15-2000 μg/m^2 for 115 acres and of 1-15 μg/m^2 for the rest of the area. The acceptable levels of exposure for the population were established at 0.075 μg/m^2 for the indoor walls of the houses, at 0.1 μg/m^2 for the outdoor walls and at 5 μg/m^2 for the

open ground. The incidence of chloracne remained between 0.6 and 1.5% in the surveyed population with a clear trend to rapid and spontaneous healing. Other toxic effects observed on occasions of acute exposure did not occur or remained at the subclinical level. Assessment of the risk estimation of continuous low level exposure and the possible cumulative effect has been made using the threshold limit values calculated for TCDD at the working place for women and the mathematical procedure of Menal and Bryan for cancer incidence rates. [Abstract #361 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2022. Shtenberg, A. I. (Inst. Nutr., Moscow, USSR) **Nekotorye itogi razvitiya pishchevoi toksikologii. [Some results of the development of food toxicology.]** *Vopr. Pitan.* (1): 3-10; 1979. (86 references) (Russian)

This review summarizes current data pertaining to the possible hazardous effect of impurities of the food products. Toxicity, mutagenicity and teratogenicity of various pesticides, regulators of plant and animal growth, and antioxidative agents are discussed. It is emphasized that the importance of the problem warrants further research on the development of effective safeguards against food impurties.

79-2023. Schultz, H.; Muecke, W. (Saarlauterner St. 109, D-8000 Munich 50, BRD) **Zur gesundheitlichen Gesamtbelastung durch Umweltchemikalien. [Composite overall health risk due to environmental chemicals.]** *Z. Allg. Med.* 55(10): 609-623; 1979. (13 references) (German)

The effect of the steady introduction of new chemicals into the environment and the simultaneous statistically determined slow reduction of male life expectancy, combined with rising cancer incidence are seen as interrelated. The toxic environmental implications of nitrosamines, aflatoxins, air pollutants, heavy metals and of ground pollution from the dumping of waste are discussed. It is suggested that new legislation is required in West Germany which would make determination of potential environmental effects mandatory for every new chemical before it is certified for mass production and distribution. Health effects and ecological risk are the criteria which should be used for limiting continued introduction of hazardous chemicals into the environment.

79-2024. Khil'chevskaia, R. I. (Lab. Genet. Monit. & Prognosis, Inst. Gen. Genet., Moscow, USSR) **Geneticheskie problemy zagriazneniia okruzhaiushchei sredy. [Genetic problems of environmental pollution].** *Zh. Vses. Khim. Ova.* 24(1): 18-25; 1979. (80 references) (Russian)

This review summarizes current data on the mutagenic activity of various environmenal polluants. Of 230 tested pesticides, 125 showed mutagenic activity. Of 77 pesticides tested 18 induced mutations in microorganisms, 64/69 in plants, 17/26 in insects, and 28/58 in mammals. Twenty-five of 44 fungicides tested, 44/70 insecticides, 41/97 herbicides, and 15/19 other pesticides were also mutagenic. The various test systems and methods for the screening of mutagens, and their effectiveness are discussed. These test systems and methods include *Salmonella typhimurium, Escherichia coli,* yeasts, *Neurospora crassa, Vicia feba, Tradescantia paludosa, Drosophila melanogaster,* chromsome abberrations and translocation, the cytogenetic analysis of blood or bone marrow cells, and the study of mutations of specific loci.

79-2025. Steiner, J., IV; Singley, J. E. (Buck Seifert & Jost Inc., Englewood Cliffs, NJ) **Methoxychlor removal from potable water.** *Am. Water Works Assoc. J.* 71(5): 284-286; 1979. (10 references)

The use of coagulation to remove turbidity from tap water using either alum or ferric sulfate did not alter the methoxychlor content of the water; it remained above the maximum contamination levels which have been set by the National Interim Primary Drinking Water Regulations. The combination of these methods with powdered activated carbon is suggested as a possible method to achieve the necessary reduction in methoxychlor levels. As the use of powdered activated carbon is expensive, the use of coagulation for treatment of the same water might reduce this cost to a more reasonable level.

79-2026. Hankawa, Y. (Hiroshima Prefect. Agric. Exp. Stn., Akitsu, Hiroshima, Japan) **[Study on residues of quintozene, hexachlorobenzene, pentachloroaniline and pentachloroanisole in soil and potato.]** *Annu. Rep. Hiroshima Pref. Agric. Exp. Stn.* 40: 81-92; 1978. (19 references) (Japanese)

The life of pentachloro nitrobenzene (quintozene) and its metabolites in soil and their residues in potato tuber were studied using two kinds of soil. The period of persistence of pentachloronitrobenzene was longer in the soil contining more humus and clay than the soil containing more sand. The period of 95% dissipation in the latter was 8.4 mo. Dissipation in spring crops was faster than in other crops. The life of hexachlorobenzene was nearly the same as pentachloro nitrobenzene. The life of pentachloro aniline and pentachloro thioanisole which are metabolites of pentachloronitrobenzene, depended on the kind of soil and season presumably due to moisture in the soil. The vertical distribution in soil of pentachloronitrobenzene and its metabolites showed a peak in the parts from 0 to 5 cm in soil when mixed by human plowing. After cultivation, however a uniform distribution from 0 to 20 cm was found. The residual amounts of pentachloronitrobenzene and its metabolites in potato tubers were larger in sandy soil than in soil with more humus and clay.

79-2027. Rosenberg, A.; Alexander, M. (Lab. Soil Microbiol., Dep. Agron., Cornell Univ., Ithaca, NY 14853) **Microbial cleavage of various organophosphorus insecticides.** *Appl. Environ. Microbiol.* 37(5): 886-891; 1979. (16 references)

Bacteria able to utilize Aspon, Azodrin (monocrotophos), Dasanit (fensulfothion), diazinon, malathion, Orthene (acephate), parathion, Trithion (carbophenothion), dimethoate, Dylox (trichlorfon), methyl parathion, and Vapona (dichlorvos) as sole phosphorus sources were isolated from soil and sewage. Individual isolates used from 3 to 10 of these insecticides as sole phosphorus sources. The extent of growth of two *Pseudomonas* strains in media containing diazinon and malathion was in the range expected from the amount of insecticide supplied, and their proliferation resulted in disappearance of the chemical. Resting cells of the pseudomonads derived from cultures grown on diazinon or malathion but not orthophosphate caused extensive destruction of these two organophosphates in the presence or absence of chloramphenicol. Extracts of the two bacteria derived from organophosphate grown cultures catalyzed the disappearance of Aspon, Azodrin, Dasanit, diazinon, malathion, Orthene, parathion, and trithion but not dimethoate, Dylox, methyl parathion, and Vapona. Results from gas chromatographic analysis suggested that the extracts formed dimethyl phosphate from azodrin, dimethyl phosphorodithioate from malathion, diethyl phosphorodithioate from Trithion, and diethyl phosphorothioate from Dasanit, diazinon, and parathion. Dimethyl phosphate, dimethyl phosphorothioate, dimethyl phosphorodithioate, diethyl phosphate, and diethyl phosphorothioate were not used by the pseudomonads as sole phosphorus sources. (Author abstract by permission)

79-2028. Hyde, R. A. (Author address not given) **International research on activated carbon in water treatment.** *Aqua* 2: 13, 15-17, 19, 20; 1979. (50 references)

The benefits and uses of activated carbon filters in water treatment are reviewed. Activated carbon has been used for taste and odor control, and as an agent for removing organic compounds from potable water. The number of organic compounds in drinking water, including trihalomehanes, agricultural runoff, and pesticide residues, is over 700, and these represent only 10-20% of the organic content of water. Activated carbon is produced from coal, coconut shell, lignite, peat, and wood at elevated temperatures. Activation at 750-950°C by steam or carbon dioxide completely rids the internal pore structure of impurities, leaving essentially pure activated carbon. When ozonation is used prior to granular activated carbon treatment, increased biological activity of the carbon bed will result. Carbon can be regenerated chemically or biologically.

79-2029. Elzorgani, G. A.; Abdulla, A. M.; Ali, M. E. T. (Agric. Res. Corp., Wad Medani, Sudan) **Residues of organochlorine insecticides in fishes in Lake Nubia.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 44-48; 1979. (12 references)

An investigation was undertaken to test for the presence of residues of pesticides in the fish of Lake Nubia. Twenty-nine fish specimens belonging to seven different species were collected at the Wadi Halfa site on Lake Nubia during December of 1975. A sample of muscle and liver tissues was collected from each fish. The samples were analyzed for organochlorine residues by gas-liquid chromatography. For identification of residues, sample chromatograms were compared with those of authentic pesticides and peak heights were used for their quantitative determination. Out of 58 samples of tissues analyzed, only 10 were found to contain detectable levels of residues. DDE was found in all of the ten samples, while DDT was found in only 3 samples. In all the specimens in which DDE and/or DDT were found in the muscle tissue, none was detectable in the liver.

79-2030. McFall, J. A.; Huang, W. Y.; Laseter, J. L. (Cent. Bio-Org. Stud., Univ. New Orleans, New Orleans, LA

70122) **Organics at the air-water interface of Lake Pontchartrain.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 80-87; 1979. (39 references)

A characterization of the organics found at the air-water interface of Lake Pontchartrain is described. Three separate samples were collected, one each month, during the spring of 1976 from the surface of Lake Pontchartrain. An aluminum backed teflon disc was employed for sample collection. The residues collected were fractionated by using a silica gel column. The alkanes were eluted with 59 ml of *n*-hexane, and then the more polar compounds were eluted with 50 ml of benzene. Each of these fractions were furher analyzed by employing glass capillary gas chromatography. Samples were then introduced to a mass spectrometer by injection from the gas chromatograph. The mass spectrometer allowed identification of the individual components in each fraction. Branched alkanes, alkyl benzenes, and polychlorinated biphenyls were found to be the predominant classes of compounds in the *n*-hexane eluate. Fatty acids, alcohols, phenolic compounds and phthalic acid esters were also found to be present in the air-water interface.

79-2031. Blus, L.; Cromartie, E.; McNease, L.; Joanen, T. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Corvallis, OR 97330) **Brown pelican: population status, reproductive success, and organochlorine residues in Louisiana, 1971-1976.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 128-134; 1979. (21 references)

The impact of organochlorine residues on population status and reproductive success of Louisiana brown pelicans is assessed. Approximately 800 pelican nestlings were transplanted from Florida to Louisiana from 1968 through 1976. From 1971 to 1976, 171 eggs were collected in all stages of incubation. The eggs were frozen soon after collection, and sent to the laboratory for processing. Measurements of eggshell thickness were done, and the eggs were analyzed for organochlorine pollutants. The contents of 110 eggs were analyzed for residues of organochlorine pesticides, their metabolites, and polychlorinated biphenyls. Eggshell thickness means of pelican eggs from 1971 through 1976 averaged 6.7 to 13.5% less than the mean thickness for eggs collected before 1947. All of the eggs analyzed contained residues of DDE and polychlorinated biphenyls. Most eggs contained residues of DDD (TDE), dieldrin, and endrin. Residues of DDT, toxaphene, and chlordanes were also identified. It is hypothesized that residues of endrin and other organochlorines were responsible for the rapid die-off of pelicans in Louisiana in 1975.

79-2032. Pieper, G. R. (Pacific Southwest Forest & Range Exp. Stn., Forest Serv., USDA, Berkeley, CA 94701) **Residue analysis of carbaryl on forest foliage and in stream water using HPLC.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 167-171; 1979. (12 references)

Aerial applicatiins were made of carbaryl to trees on the Beaverhead National Forest in Montana in 1975, at the rate of 0.45 kg/1.89 l/acre on three 1000 acre plots. A surface extraction technique was used for the analyses. Carbaryl residues were seen to drop below the 1 ppm level by 28 days after application for grass, by 47 days for geranium and 67 days for aspen. After 67 days, a residue of 3.8 ppm was found on Douglar-fir. An irreglar pattern of contamination was noted in water samples taken during the first 3 hr following spraying.

79-2033. Ripley, B. D. (Prov. Pestic. Residue Test. Lab., Ontario Minist. Agric. & Food, Univ. Guelph, Ontario N1G 2W1, Canada) **Residues of ethylenebis dithiocarbamates on field-treated fruits and vegetables.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 182-189; 1979. (25 references)

Dithane M-22 (maneb) or Dithane Z-78 (zineb) were applied to vegetable or fruit plots with a hand sprayer. Mushroom casing soil was dusted with zineb. Ethylenebis dithiocarbamate (EBDC) residues on leaves were variable. While tolerance levels were reached within 7 days, it is suggested that problems could occur with cole crops such as brussel sprouts, broccoli and cauliflower. An extention of the time after spraying and before harvesting of these crops to 14 days is recommended. At 7 days after treatment, 15 ppb zineb remained on the whole cabbage. Removing the outer leaves does reduce the contamination. Similarly removal of the top leaves from celery lowered the residue of EBDC in that crop. Zineb residues on mushrooms and in the casing material indicated only a trace of the chemical present on the mushrooms even though 10-16 ppm was present in the soil.

79-2034. Kenyon, D. J.; Elfving, D. C.; Pakkala, I. S.; Bache, C. A.; Lisk, D. J. (Dep. Pomol., New York State Coll. Agric. & Life Sci., Cornell Univ., Ithaca, NY 14853) **Residues of lead and arsenic in crops cultured on old orchard soils.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 221-223; 1979. (16 references)

Five vegetable crops, corn, cucumber, muskmelon, squash, and tomato, were planted in the field that had been an orchard. The orchard had been sprayed with lead and arsenic for many years. Upon harvest, the edible portions were analyzed for lead and arsenic. No significant differences occurred between orchard-grown and control vegetables, and no phytotoxic effects were seen in any of the crops that could be attributed to arsenic residues in the soil. Arsenic levels were 0.0 ppm in both control and experimental crops, except for tomatoes, which had 0.2 ppm of arsenic. Lead levels ranged from 1.3 ppm (corn) to 2.8 ppm (cucumber).

79-2035. Estesen, B. J.; Buck, N. A.; Ware, G. W. (Univ. Arizona, Tuscon, AZ 85721) **Dislodgable insecticide residues on cotton foliage: permethrin, curacron, fenvalarate, sulprofos, decis, and endosulfan.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 245-248; 1979. (2 references)

Cotton plants (Stoneville 265 short staple) were sprayed with Ambush (permethrin) at 0.11 kg/ha, curacron (profenofos) at 1.1 kg/ha, Pydrin (fenvalarate) at 0.11 kg/ha, Bolstar (sulprofos) at 1.1 kg/ha, Decis (FMC 45498) at 0.023

kg/ha, and Thiodan (endosulfan) at 1.1 kg/ha. Samples of leaves were collected at 0, 24, 48, 72, and 96 hr after treatment. Two rains occurred, between the 24-48 hr and the 72-96 hr samples. The rains affected sulprofos sulfoxide only. Endosulfan, curacron and sulprofos residues diminished most during the first 24 hr. The three pyrethroids sustained little loss. Fenvalarate was 65%, permethrin 47%, and Decis 32% of original levels after 96 hr.

79-2036. Jannson, B.; Vaz, R.; Blomkvist, G.; Jensen, S.; Olsson, M. (Spec. Anal. Lab., Natl. Swed. Environ. Prot. Board, Univ. Stockholm, S-10691 Stockholm, Sweden) **Chlorinated terpenes and chlordane components found in fish, guillemot and seal from Swedish waters.** *Chemosphere* 8(4): 181-190; 1979. (29 references)

Muscle and blubber samples from herrings (*Clupea harengus*), guillemot (*Uria aalge*), and gray seals (*Halichoerus gryphus*) from the Baltic Sea were analyzed for pesticide content. For comparison with the Baltic environment char (*Salvelinus fontinalis*), samples from a Swedish lake were also analyzed. Column chromatography with silica gel was used to separate PCB from chlorinated pesticides present in the samples. The highest levels of pesticides were found in guillemot and seal fat (chlorinated terpenes 17 and 11 mg/kg fat, chlordane-related compounds 0.7 and 10, DDT 170 and 970, and PCB's 210 and 830 mg/kg fat, respectively). Lowest concentrations of the chemicals were found in the inland-lake char, followed by herrings. Among chlordane compounds α and β-chlordane, *trans*-nonachlor, and oxychlordane were identified chromatographically. The levels of pesticides found in the samples indicate a serious pollution problem in the Baltic Sea.

79-2037. Gottschalk, M. R.; Shure, D. J. (Dep. Biol., Emory Univ., Atlanta, GA 30322) **Herbicide effects on leaf litter decomposition processes in an oak-hickory forest.** *Ecology* 60(1): 143-151; 1979. (45 references)

The effects of 2,4,5-T defoliation and residue accumulation on decomposition dynamics in a southeastern oak-hickory forest were determined. Plots in a Latin-square design received spray applications of 0.225 g AI/m^2 or 2.250 g/m^2 Weedone (butoxyethanol ester of 2,4,5-T). Litter bags were used to determine decomposition rates of treated and control white oak (*Quercus alba*) leaves. Weight losses of control white oak leaf litter averaged 35% during the first year, and 65% after the second year. Defoliated leaf litter exhibited significantly greater ($p < 0.01$) weight losses than control leaves. Litter decomposition rates were similar in control and treated areas. The herbicide spray treatment significantly increased ($p < 0.05$) microarthropod densities by influencing springtail (Collembola) and mite (Acari) reproductive activities for up to 8 mo.

79-2038. Meistrik, V.; Nekvasilova, G. (Inst. Reg. Ecol., Acad. Sci., Pruhonice, Czechoslovakia) **Effect of the fungicide Lastanox T20 on certain soil microorganisms.** *Ekologiya (Sverdlovsk)* 1: 11-18; 1978. (26 references)

The growth of *Eusarium nivale* was inhibited by all concentrations of Lastanox T20 (a substitute for phenylmercuric chlorides) which were studied. As the concentrations decreased, so did the inhibitory effect. At the maximum concentration tested, Lastanox completely destroyed the microorganism colony after 432 hr of treatment. When testing on several higher fungal species, no concentration of Lastanox inhibited the mycorhiza *B. luridus*. There was, however, an inhibitory effect against *A. bisporus*, *P. ostreatus*, and *F. nivale*. Only the highest concentrations depressed growth of *H. fasciculare*. Tests showed that Lastanox inhibited the activity of cellulose-decomposing microorganisms. Studies were also made of the effect of Lastanox on nitrofication in three types of soils. It was concluded that Lastanox had little effect on the nitrification processes of the soil.

79-2039. Hashemy-Tonkabony, S. E.; Gharibzadeh, M. (Res. Lab., Dep. Food Hyg., Univ. Tehran, Tehran, Iran) **Detection and determination of chlorinated pesticide residues in fish from Tehran reservoirs.** *Environ. Res.* 18(2): 276-280; 1979. (7 references)

One hundred samples of fish from Karadj and Latian Lake (two of the reservoirs supplying Tehran with potable water) were analyzed for detection and determination of pesticide residues. DDT, including its metabolites TDE and DDE, were the pesticides most commonly found. In the Karadj reservoir the mean concentration of total DDT compounds found in whole fish was 0.049 $\pm$ SD 0.0032 ppm while that of the Latian reservoir was 0.065 $\pm$ SD 0.007 ppm. The mean concentration of the pesticide in fat was 3.11 $\pm$ 0.21 and 4.85 $\pm$ 0.13 ppm, respectively. This shows the Latian reservoir to be more contaminated. Extreme concentrations of pesticides in Latian fish were found in *Varicorhinus nikolskii*, while in Karadj fish the highest level of the pesticide occurred in *Salmo-trutta fario* and the lowest concentration in *Varicorhinus nikolskii*. Samples collected in summer showed the highest concentrations of the pesticides. (Author abstract by permission of Academic Press)

79-2040. Shtannikov, E. V.; Stepanova, N. Iu.; Podzemel'nikov, E. V. (Dep. Gen. Hyg., Med. Inst., Saratov, USSR) **Transformatsiia iadokhimikatov v processe ozonirovaniia vody. [Transformation of pesticides during ozonization of water].** *Gig. Sanit.* 44(3): 15-18; 1979. (1 reference) (Russian)

A potential transformation of organochlorine and organophosphorous pesticides during ozonization of water was studied. Ozone at conventional doses (5-20 mg/l) caused a 15-60% destruction of OPP. Increased doses of ozone (50-100 mg/l) caused 70% destruction of DDT, 10-50% destruction of metaphos (methyl parathion) and 75-85% destruction of chlorophos (trichlorfon). Ozonization decreased the toxicity of chlorophos (LD50 increased from 560 to 900 mg/kg); 70% destruction of metaphos did not decrease its toxicity, while 30% destruction decreased the LD50 from 67 mg/kg to 30 mg/kg. Toxicity of BHC decreased when 40-50% BHC was ozonated. Seventy percent destruction of DDT resulted in transformation into a more toxic compound

(LD50 decreased from 720 to 320 mg/kg). Exposure of rats to ozonated pesticides (at 0.1 LD50) resulted in significant decreases in cholinesterase activity in peripheral blood. Rats exposed to intact and ozonated (30% destruction) DDT exhibited marked necrobiotic changes in the cardiac muscle.

79-2041. Buslovich, S. Iu.; Aleksashina, Z. A.; Borushko, N. V.; Voinova, I. V.; Voitak, N. P.; Dubenetskaia, M. M.; Kolosovskaia, V. M.; Petent, R. L. (Byelorussian Res. Sanit. Hyg. Inst., Minsk, USSR) **Usloviia truda pri primenenii linurona v sel'skom khoziaistve. [Working conditions during the use of linuron in agriculture.]** *Gig. Sanit.* 44(3): 72-73; 1979. (Russian)

The herbicide linuron was used for treatment of carrot and potato in field studies in 1976-77. Linuron was applied at a rate of 2 kg (AI)/ha. Insignificant amounts of linuron were detected on the skin of the tractor driver; 0.002 mg/100 cm^2 on the face and 0.02 mg/100 cm^2 on the hands. The wind velocity was 3.3 m/sec and linuron could be detected within 20 m of the field border at a level of 0.012 mg. Linuron residues were also detected in the carrot and potato samples. Vegetables treated with linuron had significantly decreased ascorbic acid and carotene levels.

79-2042. Raupach, M.; Emerson, W. W.; Slade, P. G. (Div. Soils, CSIRO, Glen Osmond 5064, South Australia, Australia) **The arrangement of paraquat bound by vermiculite and montmorillonite.** *J. Colloid Interface Sci.* 69(3): 398-408; 1979. (20 references)

The adsorption of paraquat dichloride onto montmorillonite clays and vermiculite was studied by means of polarized attenuated total reflectance infrared spectroscopy and single crystal X-ray diffraction techniques. The examination of paraquat and Llano vermiculite showed the formation of a closely packed layer of uniformly oriented cations with pyridinium rings situated over and partly into hexagonal holes between surface oxygen atoms of the vermiculite. The configuration of paraquat in other vermiculites was similar. Paraquat complexed with montmorillonite exhibited flat rings. The basal spacings of paraquat-vermiculite and montmorillonite were 141 and 124 nm when air dried, and 128 and 124 nm, respectively, after heating at 80°C. The long axes of organic cations were found to be parallel to the basal surfaces of both vermiculite and montmorillonite. Vibrational information and models of the packing order of organic cations on the surface of vermiculite are given. The effects of charge and water content on the adsorption of paraquat by soils is also discussed.

79-2043. Osborne, G. J.; Donohoe, T. M. (Dep. Agric., Agric. Res. Inst., Wagga Wagga, New South Wales 2650, Australia) **Residual levels of paraquat in a red earth soil after 7 years of minumum and reduced cultivation.** *J. Austr. Inst. Agric. Sci.* 43(3-4): 169-170; 1977. (7 references)

Paraquat was applied to two plots of test soil at about 4.5 ppm. A third plot was used as a control. The experimental plots were seeded with wheat by 1) full disturbance of the top 5-6 cm, 2) partial disturbance of the top 5-6 cm, and 3) control, full disturbance of the top 10 cm. Treatment was continued for 7 yr, at the end of which time soil samples were analyzed by spectrophotometric procedures. Between 50 and 78% of the paraquat was recovered, indicating that substantial amounts had accumulated in the soil.

79-2044. Harding, G. C. H.; Vass, W. P. (Marine Ecol. Lab., Bedford Inst. Oceanog., Dep. Fish, & Oceans, Dartmouth, Nova Scotia B2Y 4A2, Canada) **Uptake from seawater and clearance of *p,p'*-DDT by marine planktonic crustacea.** *J. Fish. Res. Board Can.* 36(3): 247-254; 1979. (47 references)

A simple exponential model is used to interpret the simultaneous uptake and clearance of *p,p'*-DDT by euphausiids and copepods to and from seawater. The clearance rate constant for euphausiids, $Kj = 0.043/d$, is not significantly different from that observed for copepod, 0.048/d. No trend in Kt values is detected over the range of *p,p'*-DDT concentrations in seawater used, 27.8-1388 ng/l. Furthermore, there is a great deal of overlap in the uptake rate constant values between organisms. Uptake rate constants range from 0.76 to 1.21 X 10^4/d for euphausiids and from 1.04 to 2.51 X 10^4/d for copepods. There appears to be no need to use a surface-area term if the concentration of *p,p'*-DDT in the organism is expressed per unit dry weight even though the euphausiids are 2 orders of magnitude larger than copepods. Knowing levels of Σ DDT present in planktonic crustanceans in nature, back calculations suggest that there must be $< < 0.1$ ng Σ DDT/l in seawater. A considerable amount of the Σ DDT reported in seawater must therefore be unavailable to planktonics because it is bound to particles. (Author abstract by permission)

79-2045. Khilik, L. A.; Bondarenko, T. I.; Karpova, G. Ia. (All-Union Res. Inst. Essent. Oil Cult., Krasnodar, USSR) **Vliianie trekhletnego primeneniia prometrina na produktivnost' kotovnika zakavkazskogo i microfloru pochvy. [Effect of 3-yr use of prometryne on productivity of transcaucasian catnip and soil microflora.]** *Khim. Sel'sk. Khoz.* 17(2): 43-46; 1979. (Russian)

During 1973 and 1975, the herbicide prometryne was applied annually (at 2, 3, 4 and 2+2 kg/ha) to crops of the essential-oil bearing plant *Nepeta* sp. The 2-yr application at 4 kg/ha decreased the number of microorganisms in the 0.15 cm soil layer in the spring. At the end of the third year prometryne inhibited the microflora throughout entire vegetative period of catnip. The residues of prometryne were detected in the catnip plant after 2 yr and, especially, after 3 yr application at 3-4 kg/ha (0.02-0.04 and 0.08-0.1 mg/kg, respectively). Prometryne at 4 kg/ha decreased the yield of catnip from 222.4 mc (metric centner)/ha to 186.0 mc/ha after the 2-yr application and from 201.9 to 154.6 mc/ha after the 3-yr application. These findings indicate that prometryne can not be recommended for use on catnip plantations.

79-2046. Klisenko, M. A.; Girenko, D. B.; Petrosian, M. S. (All-Union Res. Inst. Hyg. & Toxicol., Kiev, USSR) **O fotolize mezoranila. [Photolysis of mesoranil.]** *Khim. Sel'sk. Khoz.* 17(2): 54-58; 1979. (6 references) (Russian)

An attempt was made to evaluate the possibility of formation of stable radicals and identify the products of photolysis of the herbicide Mesoranil (aziprotryne). A 0.2 mg sample of Mesoranil was UV irradiated and the products of photolysis in the mixture were identified by chromatography and spectroscopy. Gas-liquid chromatography revealed the presence of compounds with triazine rings and mercaptanes. UV-irradiation induced the appearance of a weak singlet (g = 2.006) in the paramagnetic spectrum of Mesoranil. The IR spectra of mesoranil irradiated with UV did not have an absorption band at 1.325/cm, which indicated the transformatin of the methylmercapto radical. The IR spectra showed no absorption bands at 1.345-1.180/cm and had decreased intensity of absorption at 2.120-2.160/cm. These were indicative of degradation of the azide group during photolysis.

79-2047. Satsmadjis, J.; Gabrielides, G. P. (Inst. Oceanogr. & Fish. Res., Athens, Greece) **Observations on the concentration levels of chlorinated hydrocarbons in a Mediterranean fish.** *Mar. Pollut. Bull.* 10(4): 109-111; 1979. (9 references)

Striped mullet were caught from the Saronikos Gulf and samples were analyzed for the presence of various chlorinated hydrocarbons. Aldrin, heptachlor and heptachlor epoxide were not always detected, or in small concentrations. Endrin was detected in most samples, but in concentrations not exceeding 2.2 ng/g. BHC (total) was noted in all samples, with the highest value being 10 ng/g. Dieldrin was found in all samples, the highest value being 50 ng/g. When DDT, DDE, and DDD (TDE) levels were separated, DDE was the major compound found and DDD was present in the smallest amoung. Higher levels of PCB's and total DDT were found in coastal areas than in samples taken from the open sea.

79-2048. Minagawa, K. (Dep. Public Health, Sch. Med., Akita Univ., Akita, Japan) **Transfer mechanisms of OCP, PCB and PCT from the environment to the human body.** *Nippon Eiseigaku Zasshi (Jpn. J. Hyg.)* 33(6): 778-813; 1979. (76 references)

BHC contamination was found in milk samples with 67% of the total BHC being β-BHC. It is suspected that this contamination was due to transfer from paddy straw contaminated with BHC. In 1973 these residues were only one tenth of the level found in 1971 studies. Most of the fruits and vegetables tested contained BHC and DDT residues. Dieldrin levels were particularly high in cucumber and potatoes. Aldrin was suspected to be the immediate cause due to its use as a soil fungicide. Fish contained high PCB accumulations. Vegetable foodstuffs, fish and shellfish, and dairy products did not contain PCT residues. BHC, DDT, dieldrin, PCB, and PCT were detected in human milk samples with no significant changes in levels of contamination from the 1971 to the 1973 study. Human fat tissue contained OCP, PCB, and PCT at levels similar to those found in human milk. Seasonal variations were noted in the OCP survey of standard diet samples in Niigata. Meat and vegetables contained especially high amounts of OCP. DDT transfer to the body from cigarette smoking, while noted, was slight. Gills and the body surface of fish were noted to be important routes for PCB uptake.

79-2049. Butler, P. A.; Schutzmann, R. L. (Ecol. Monit. Branch, Tech. Serv. Div., US EPA, Gulf Breeze, FL 32561) **Residues of pesticides and PCBs in estuarine fish, 1972-76 - National Pesticide Monitoring Program.** *Pestic. Monit. J.* 12(2): 51-59; 1978. (12 references)

This report summarizes 1524 analyses of juvenile fish collected semiannually in 144 estuaries nationwide from July 1972 through June 1976. Pooled samples of 25 whole fish were screened for 20 common pesticides and polychlorinated biphenyls (PCB's). The three most common residues, DDT, PCB's, and dieldrin, were found in 39, 22, and 5% of the samples, respectively. Data indicate that estuarine pollution levels continue to decline. (Author abstract by permission)

79-2050. Frank, R.; Holdrinet, M.; Braun, H. E.; Dodge, D. P.; Sprangler, G. E. (Prov. Pestic. Residue Test. Lab., Ontario Minist. Agric. & Food, Univ. Guelph, Guelph, Ontario N1G 2W1, Canada) **Residues of organochlorine insecticides and polychlorinated biphenyls in fish from Lakes Huron and Superior, Canada - 1968-76.** *Pestic. Monit. J.* 12(2): 60-68; 1979. (11 references)

Five species of fish from Lake Superior and 12 species from Lake Huron were analyzed for organochlorine pesticides and polychlorinated biphenyls (PCB's) between 1968 and 1975. Mean residues of ΣDDT peaked at 1.72 and 7.60 ppm in lake trout (*Salvelinus namaycush*) from Lakes Superior and Huron, respectively. By 1975, the mean level of Σ DDT had decreased in lake trout and was highest in bloaters (*Coregonus hoyi*) from both lakes: 1.06 ppm and 1.87 ppm, respectively. Dieldrin levels in fish from Lake Superior changed little over the same period. However, in 1969-70, dieldrin levels in fish from Lake Huron exceeded the 0.3 ppm tolerance level set by the Health and Welfare Canada or the FDA, US DHEW, in 5% of lake whitefish (*Coregonus clupeaformis*) and 10% of bloaters. By 1975, 50% of bloaters caught in Georgian Bay and North Channel had dieldrin levels above 0.3 ppm. PCB residues declined in lake trout and lake whitefish caught in Lake Superior beween 1971 and 1975, but increased slightly in bloaters and white sucker (*Catostomus commersoni*). Mean PCB residues in bloaters caught in Lake Huron in 1969-71 and 1975-76, and splake (*Salvelinus fontinalis* and *S. namaycush*) and cisco (*Coregonus artedii*) caught in 1975 exceeded the 2 ppm tolerance level. (Author abstract by permission)

79-2051. Frank, R.; Braun, H. E.; Holdrinet, M.; Dodge, D. P.; Nepszy, S. J. (Prov. Pestic. Residue Test. Lab., Ontario Minist. Agric. & Food, Univ. Guelph, Guelph, Ontario N1G

2W1, Canada) **Residues of organochlorine insecticides and polychlorinated biphenyls in fish from Lakes Saint Clair and Erie, Canada - 1968-76.** *Pestic. Monit. J.* 12(2): 69-80; 1978. (16 references)

Eighteen species of fish from Lake Saint Clair and 19 species from Lake Erie were analyzed for organochlorine pesticides and polychlorinated biphenyls (PCB's) between 1968 and 1976. Mean residues of ΣDDT peaked at 1.19 ppm in longnose gar (*Lepisosteus osseus*) caught in Lake Saint Clair in 1970-71, but had declined in all species by 1975-76. Dieldrin levels in fish tissues increased over the same period. White bass (*Morone chrysops*), caught in 1975 in Lake Erie, had the highest mean residue of dieldrin at 0.17 ppm. PCB residues increased in some species and decreased in others. PCB residues exceeding the tolerance level of Health and Welfare Canada were found in the following: from Lake Saint Clair, smallmouth bass (*Micropterus dolomieui*) in 1975 and channel catfish (*Ictalurus punctatus*) in 1971; from Lake Erie, coho salmon (*Oncorhynchus kisutch*) in 1970, smallmouth bass, alewife (*Alosa pseudoharengus*), freshwater drum (*Aplodinotus grunniens*), and gizzard shad (*Dorosoma cepedianum*) in 1971, and white bass in 1971 and 1976. Sediments in Lake Erie were five to ten times more highly contaminated with ΣDDT, dieldrin, and PCB's than were sediments from Lake Saint Clair. ΣDDT and dieldrin residues in fish tissues did not necessarily reflect this trend, but PCBs were higher in fish from Lake Erie.

79-2052. Soedergen, A.; Djirsarai, R.; Gharibzadeh, M.; Moinpour, A. (Inst. Limnol., Univ. Lund, Lund, Sweden) **Organochlorine residues in aquatic environments in Iran, 1974.** *Pestic. Monit. J.* 12(2): 81-86; 1978. (17 references)

Organochlorine pesticide residues in various organisms from different aquatic ecosystems in Iran were investigated in spring 1974. DDT levels were high in fish taken from two rivers in southern Iran, whereas low levels were detected in samples obtained from a freshwater lake in the same area. Fish from two of the reservoirs supplying Tehran with potable water contained moderate levels of DDT. The low residue level in pike collected in the Bandar-Pahlavi Mordab in northwest Iran indicates that only a small amount of organochlorine pesticides used in this area enters the pelagic food chain. Sturgeon collected at different places in the Caspian Sea showed similar accumulations of DDT in the muscles and in the eggs. Polychlorinated biphenyls (PCBs) were detected only in samples of sediment from the drainage systems in Tehran. (Author abstract by permission)

79-2053. Sumner, C. E. (Tasmanian Fish. Dev. Auth., Hobart, Tasmania 7001, Australia) **Chlorinated hydrocarbon pesticide residues in Pacific oysters (*Crassostrea gigas*) from Tasmania, Australia - 1973.** *Pestic. Monit. J.* 12(2): 87-90; 1978. (18 references)

Pacific oysters (*Crassostrea gigas* Thunberg) from 19 sites in Tasmania were surveyed for pesticide residues. All samples were analyzed for dieldrin and DDT, and five samples were analyzed for hexachlorobenzene (HCB) and lindane. Only DDT was found in all samples. Dieldrin levels were high in oysters from the Tamar River, but were highest (0.38 mg/kg wet weight) in samples from Ruffin's Bay. In contrast, other residue levels were low. Distribution of pesticides in Tamar River samples differed: dieldrin could be correlated with industrial uses upstream and DDT could be correlated with low-level widespread agricultural use. (Author abstract by permission)

79-2054. Dhaliwal, G. S.; Kalra, R. L. (Dep. Entomol., Punjab Agric. Univ., Ludhiana 141004, Punjab, India) **DDT residues in butter and infant formula in India, 1977.** *Pestic. Monit. J.* 12(2): 91-93; 1978. (12 references)

Samples of commercial brands of butter and infant formula from different parts of India were examined for DDT residues. All 18 samples of butter representing nine brands were contaminated. Levels of DDT residues ranged from 0.42 to 11.36 ppm and exceeded the Food and Agriculture Organization/ World Health Organization practical residue limit of 1.25 ppm in 90 percent of the samples. All four brands of infant formula contained DDT residues above the practical residue limit. Most DDT residues were in the form of *p,p'*-TDE in both commodities. This contamination of milk with excessive amounts of DDT residues seems to be widespread in India. (Author abstract by permission)

79-2055. Glooschenko, W. A.; Sampson, R. C. J. (Geol. Sect. Process, Res. Div., Canada Cent. Inland Waters, Burlington, Ontario L7R 4A6, Canada) **Organochlorine pesticides and polychlorinated biphenyls on sediments from a subarctic salt march, James Bay, Canada - 1976.** *Pestic. Monit. J.* 12(2): 94-95; 1978. (5 references)

Sediment samples were collected from a subarctic salt marsh on James Bay, Ontario in May 1976. Of 15 organochlorine compounds analyzed, trace amounts mainly of *p,p'*-DDE and polychlorinated biphenyls (PCBs) were detected, but could not be quantitated. (Author abstract by permission)

79-2056. Butler, P. A.; Kennedy, C. D.; Schutzmann, R. L. (Ecol. Monit. Branch, Tech. Serv. Div., US EPA, Gulf Breeze, FL 32561) **Pesticide residues in estuarine mollusks, 1977 versus 1972 - National Pesticide Monitoring Program.** *Pestic. Monit. J.* 12(3): 99-101; 1978. (4 references)

Bivalve mollusks were monitored for residues of 20 organochlorine and organophosphate pesticides and polychlorinated biphenyls in spring 1977 in 87 of the 181 estuaries routinely monitored on a monthly basis during 1965-72. DDT, the only pesticide detected in 1977, occurred at low levels in one estuary each on the Atlantic and Pacific Coasts. (Author abstract by permission)

79-2057. Picer, M.; Picer, N.; Ahel, M. (Cent. Mar. Res., Rudjer Boskovic Inst., Yu-41001 Zagreb, Yugoslavia) **Chlorinated insecticide and PCB residues in fish and mussels of east coastal waters of the middle and north Adriatic Sea,**

1974-75. *Pestic. Monit. J.* 12(3): 102-112; 1978. (22 references)

Concentrations of chlorinated pesticides and polychlorinated biphenyls (PCB's) were determined in mussels (*Mytilus galloprovincialis*) and goby fish (*Gibius* sp.) collected in four areas located in eastern coastal waters of the middle and north Adriatic Sea. Most samples were collected in early spring and late summer of 1974 and 1975. The compounds *p,p'*-DDT, *p,p'*-DDE, *p,p'*-TDE and PCB's were detected most frequently. In about 60% of the samples dieldrin was also detected. Average wet-weight concentrations of Σ DDT and PCB's in mussels from the four areas samples were: Istrian coast, 65 and 76 ppb; Rijcka Bay, 58 and 75 ppb; Zadar, 36 and 128 ppb; Losinj Island, 167 and 133 ppb. Average concentrations in fish samples were: Istrian coast, 124 and 144 ppb; Rijcka Bay, 37 an 82 ppb; Losinj Island, 166 and 157 ppb. Dieldrin concentrations were in the low ppb range. Although major Italian rivers discharge chlorinated hydrocarbons into the north Adriatic, sampling of biota from Istrian coastal waters indicates no significant effect on the pollution level. However, waste waters from small coastal settlements evidently do contribute significantly to chlorinated hydrocarbon contamination of that ocean. Marine samples from Losinj Island had high chlorinated hydrocarbon concentrations, indicating uptake of pollutants from the north Adriatic. (Author abstract by permission)

79-2058. Clark, D. R., Jr.; Krynitsky, A. (Patuxent Wildl. Res. Cent., US Fish & Wildl. Serv., Laurel MD 20811) **Organochlorine residues and reproduction in the little brown bat, Laurel, Maryland - June, 1976.** *Pestic. Monit. J.* 12(3): 113-116; 1978. (6 references)

Twelve of 43 pregnant little brown bats (*Myotis lucifugus*) collected at Montpelier Barn, Laurel, Maryland, gave birth to dead young. Eleven of these 12 dead neonates were abnormally small. Most of the stillbirths were attributable to unknown reproductive difficulties associated with first pregnancies, but four may have been due to high concentrations of polychlorinated biphenyls (PCB) in the newborn. Residues of the PCB, DDE, and oxychlordane crossed the placenta at similar rates. (Author abstract by permission)

79-2059. Carey, A. E.; Gowen, J. A.; Tai, H.; Mitchell, W. G.; Wiersma, G. B. (Benefits & Field Stud. Div., Ecol. Monit. Branch, Off. Pestic. Programs, US EPA, Washington, DC 20460) **Pesticide residue levels in soils and crops, 1971 - National Soils Monitoring Program (III).** *Pestic. Monit. J.* 12(3): 117-136; 1978. (11 references)

Data from the 1971 National Soils Monitoring Program are summarized. Composite samples of soil and mature crops were scheduled for collection from 1,533 4-hectare sites in 37 states. Analyses were performed on 1,486 soil samples for organochlorines, organophosphates, PCBs, and elemental arsenic; samples were analyzed for atrazine only when pesticide application data indicated current-year use. Organochlorine pesticides were detected in 45 percent of the soil samples in the following order of frequency: dieldrin, ΣDDT, aldrin, chlordane, and heptachlor epoxide. Most pesticide levels ranged from 0.01 to 0.25 ppm. Crop samples were collected from 729 sites, and all were analyzed for organochlorines. Crop samples were analyzed for organophosphates and atrazine only when pesticide application data indicated current-year use. Organochlorines were detected in 42 percent of the crop samples analyzed, organophosphates in 13 percent, and atrazine in 1 percent.

79-2060. Wegman, R. C. C.; Greve, P. A. (Lab. Toxicol., Natl. Inst. Public Health, Bilthoven, The Netherlands) **Organochlorines, cholinesterase inhibitors, and aromatic amines in Dutch water samples, September 1969 - December 1975.** *Pestic. Monit. J.* 12(4): 149-162; 1978. (23 references)

The Dutch aquatic environment was monitored from September 1969 to December 1975 for organochlorine pesticides and their metaboblites, cholinesterase inhibitors, and aromatic amines. The 1,492 samples analyzed included surface water, rainwater, groundwater, and drinking water. The highest concentrations of hexachlorobenzene (HCB) and α- and β-benzene hexachloride (BHC) were found in the Rhine River and its tributaries. Concentrations of the compounds in the Dutch part of the Rhine River decreased downstream. Other organochlorine pesticides and their metabolites, heptachlor, heptachlor epoxide, aldrin, dieldrin, endrin, α- and β-endosulfan, and ΣDDT were detected occasionally, but only in low concentrations. Cholinesterase inhibitors and aromatic amines were always present in the Rhine River and its tributaries. (Author abstract by permission)

79-2061. Nigg, H. N.; Reinert, J. A.; Fitzpatick, G. E. (Agric. Res. & Educ. Cent., Inst. Food & Agric. Sci., Univ. Florida, Lake Alfred, FL 32611) **Acephate and methamidophos residue behavior in Florida citrus, 1976.** *Pestic. Monit. J.* 12(4): 167-171; 1979. (11 references)

The half-life of acephate and its hydrolysate, methamidophos, in the rind of Temple and Valencia oranges, and grapefruit, lemons, and tangerines was 10.3 days and 10.5 days, respectively. Half-lives of acephate and methamidophos in citrus pulp were 15.0 days and 6.1 days, respectively, based on 7-, 14-, and 21-day data. Seven days after treatment, acephate and methamidophos reached maximum levels in rind and pulp. Acephate residue levels in rind were less than 3.0 ppm 14 days after treatment; acephate residues in pulp were less than 3.0 ppm throughout the experiment. Methamidophos residue levels averaged less than 0.25 ppm after 21 days. (Author abstract by permission)

79-2062. Blus, L. J.; Lamont, T. G.; Neely, B. S., Jr. (Pacific Northwest Field Stn., US Fish & Wildl. Serv., Corvallis, OR 97330) **Effects of organochlorine residues on eggshell thickness, reproduction, and populations status of brown pelicans (*Pelecanus occidentalis*) in South Carolina and Florida, 1969-76.** *Pestic. Monit. J.* 12(4): 172-184; 1979. (21 references)

Shells of brown pelican (*Pelecanus occidentalis*) eggs

collected in South Carolina from 1969 through 1975 and in Florida during 1969, 1970, and 1974 were significantly thinner ($P > 0.05$) than eggshells collected before 1947. Thickness of South Carolina eggshells increased in 1975, and mean thickness of eggshells collected in Florida during 1974 was greater than that of eggshells collected during 1969 and 1970, primarily in Gulf Coast colonies. Residues of 13 organochlorines were found in eggs and tissues of pelicans found dead during 1974 and 1975, although residues in brains of these specimens were not high enough to cause death. Residues of organochlorines, except PCB's, declined through 1975. PCB's increased in eggs from Atlantic Coast colonies. Reproductive success and population status of brown pelicans in South Carolina have improved markedly since authors began their studies in 1969. Good reproductive success was reported in 3 of 5 years from 1973 through 1977. (Author abstract by permission)

79-2063. Olsen, P.; Settle, H. (Div. Wildl. Res., CSIRO, Lyneham, Australian Capital Territory 2602, Australia) **Pesticide contamination of water rats in the Murrumbidgee irrigation areas, New South Wales, Australia, 1970-72.** *Pestic. Monit. J.* 12(4): 185-188; 1979. (8 references)

Organochlorine pesticides were found in all samples of livers, kidneys, mammary glands, and fetuses of eastern water rats (*Hydromys chrysogaster*) collected in the Murrumbidgee irrigation areas of New South Wales in 1970 and 1972. DDE was the predominant residue. Livers contained 0.01-3.10 ppm ΣDDT air-dried weight; kidneys, < 0.01-1.12 ppm; mammary glands, 0.14-23.75 ppm; and fetal liver, 0.28-0.66 ppm. Variations in residue levels are discussed in relation to the possible effects of environmental and physiological factors. (Author abstract by permission)

79-2064. Rosewell, K. T.; Muir, D. C. G.; Baker, B. E. (Dep. Agric. Chem. & Phys., Macdonald Coll., McGill Univ., Saint Anne-de-Bellevue, Quebec HOA 1CO, Canada) Organochlorine residues in harp seal *(Phagophilus groenlandicus)* tissues, Gulf of St. Lawrence, 1971, 1973. *Pestic. Monit. J.* 12(4): 189-197; (4 references)

Levels of *p,p'*-DDT, *p,p'*-TDE, *p,p'*-DDE, dieldrin polychlorinated biphenyls (PCB's). and HCB were determined in certain tissues of 31 harp seals (*Phagophilus groenlandicus*), taken from the Gulf of St. Lawrence during 1971 and 1973. The seals ranged in age from less than 2 wk to 18 yr. Mean concentrations of PCB's and ΣDDT in the various tissues were about the same. ΣDDT levels were 1.64-9.88 ppm in adult seal blubber and 1.08-3.73 ppm in seal pup blubber. Organochlorine levels in harp seal samples taken in 1973 were similar to those reported by other workers for samples collected in the Gulf of St. Lawrence during 1967-71. (Author abstract by permission)

79-2065. Carey, A. E.; Gowen, J. A.; Tai, H.; Mitchell, W. G.; Wiersma, G. B. (Ecol. Monit. Branch, Benefits & Field Stud. Div., Off. Pestic. Programs, US EPA, Washington, DC 20460) **Pesticide residue levels in soils and crops from 37 states, 1972 - National Soils Monitoring Program (IV).** *Pestic. Monit. J.* 12(4): 209-229; 1979. (8 references)

Residue data from the 1972 (FY-73) National Soils Monitoring Program are summarized. Composite samples of agricultural soil and mature crops were collected from 1,483 of the 1,533 selected 4-hectare sites in 37 states. Analyses were performed for organochlorine and organophosphorus compounds, trifluralin, and polychlorinated biphenyls (PCBs); analysis for atrazine was performed only when pesticide application data indicated current-year use. Organochlorine pesticides were detected in 45 percent of the soil samples. The most frequently detected cmpound was dieldrin, found in 27 percent of all soil samples. Other compounds detected, in order of frequency, included DDT, aldrin, chlordane, and heptachlor epoxide, found, respectively, in 21, 9, 8, and 7 percent of all soil samples. Crop samples were collected from 727 sites. All were analyzed for organochlorines; analyses were performed for organophosphates and atrazine only when pesticide application data indicated current-year use. For all crops, 40 percent of the samples contained detectable levels of organophosphates. Atrazine was not detected. (Author abstract by permission)

79-2066. Lang, J. T.; Rodriguez, L. L.; Livingston, J. M. (Entomol. Serv., Occupat. & Environ. Health Lab., USAF, APO, San Francisco, CA 96274) **Organochlorine pesticide residues in soils for six U.S. Air Force bases, 1975-76.** *Pestic. Monit. J.* 12(4): 230-233; 1979. (6 references)

Soil samples collected during 1975 and 1976 from United States Air Force installations in California, Georgia, Ohio, Oklahoma, Texas, and Utah were analyzed for organochlorine pesticide residues. ΣDDT, chlordane, and dieldrin were the pesticides most commonly found. In 1975, ΣDDT residues were significanly higher in samples from residential areas than in samples from golf courses or areas free of pesticide application. Chlordane residues in 1975 were significantly higher in both residential and golf course areas than in areas where pesticides had not been used. No significant differences were found in 1976 in residue levels of any pesticide monitored among various land use areas. (Author abstract by permission)

79-2067. Bozzay, J.; Rusznak, I.; Varga, I. (Lehrstuhl Org. Chem., Tech. Univ., Budapest, Hungary) **Pruefung des Adsorptionsverlaufes von Schaedlings bekaempfungsmitteln an Huminsaeure in Anwesenheit von Tensiden. [Testing the course of adsorption of insecticides by humic acid in the presence of surface active agents.]** *Pharmazie* 34(2): 92-95; 1979. (15 references) (German)

Since soil disinfection of soils with high humus content requires large amounts of pesticides connected with increased environmental risk and high cost, knowledge of the adsorption characteristics of various pesticides is important. Adsorption of the MKF-189 phenol-carbamide type pesticide, Chinoin, by humic acid of known physical characteristics from a water solution of sodium lauryl sulfate adjusted

to 3 different ranges of critical micelle concentration by the addition of electrolytes was determined by adsorption anlysis from mixture absorption isotherms. In the presence of increasing amounts of sodium lauryl sulfate adsorption of the pesticide decreased discontinuously in the critical micelle concentration range of the surface active agent which is explained by the incorporation of pesticide molecules into cells of the surface active agent. This allows establishment of equilibrium in the solid adsorbent liquid system.

79-2068. Dagley, S. (Dep. Biochem., Coll. Biol. Sci., Univ. Minnesota, St. Paul, MN 55108) **Determinants of biodegradability.** *Q. Rev. Biophysics* 11(4): 577-602; 1978. (32 references)

The factors which determine a compound's biodegradability are outlined and the biochemistry of some microbial degradative enzymes is considered. Microbial enzymes catalyze the controlled oxidation of numerous compounds by using molecular oxygen and incorporating it into molecules. The benzene ring is used as an example of how microbes can degrade a compound to produce metabolites for the Krebs cycle. The fact that microbes choose between available reaction sequences to degrade the most useful organic compounds is emphasized. Man-made and industrial products, especially substituted aromatic hydrocarbons, are not readily biodegradable because microbes do not have the proper enzymatic sequences to handle them. Microbes cannot degrade 4-chlorobenzoate as they would benzoate because the specialized biochemical reactions involving halogenated compounds are not available. The scope and limitations of microbial metabolism should be understood before a man-made compound which is not biodegradable gains widespread use. It is also pointed out that microbial degradative enzymes can transform a harmless compound into a toxic product. The synthesis of methylmercury from $Hg^{2}+$ ions by certain methane-forming anaerobes is given as an example of this phenomenon.

79-2069. Tu, C. M. (Res. Inst., Agric. Canada, London, Ontario, Canada) **Effect of pesticides on acetylene reduction and microorganisms in a sandy loam.** *Soil Biol. Biochem.* 10(6): 451-456; 1978. (29 references)

The effects of 32 pesticides on the activity of N_2-fixing bacteria and on populatons of indigenous microorganisms in a sandy loam are described. A sandy loam with a pH of 7.8 in water was used as the soil in this study. The pesticides tested included organophosphorus, carbamate and pyrethroid insecticides as well as several fumigants, fungicides, and herbicides. The required amounts of pesticide were dissolved in a petroleum ether-acetone solvent mixture and mixed with carrier sand. After the solvent had evaporated, the treated sand was mixed into the soil. Soil microorganisms were counted by a soil-dilution plate technique, using albuminant agar for bacteria and bengal-streptomycin agar for fungi. The N_2 fixers were counted using a medium consisting of glucose, $MgSO_4$, $FeSO_4$, $CaCl_2$, and 20 g agar/l of distilled water. For the assay of C_2H_2 production by gc, samples received 1 ml purified C_2H_2. Peak areas for C_2H_4 and C_2H_2 were directly proportional to their concentrations over the range used in all assays. The population of N_2 fixers was not suppressed significantly by the pesticides. Bacterial and fungal populations initially decreased in some instances, but recovered rapidly to levels similar to those in the controls.

79-2070. Hsu, J. C.; Camper, N. D. (Dep. Microbiol. & Plant Pathol., Clemson Univ., Clemson, SC 29631) **Degradation of ioxynil by a soil fungus, *Fusarium solani*.** *Soil Biol. Biochem.* 11(1): 19-22; 1979. (10 references)

An examination of the degradation of ioxynil by the soil fungus, *Fusarium solani*, is described. Stock cultures of *Fusarium solani* were maintained on plants of potato dextrose agar at 4°C. The stock culture was transferred to a yeast extract glucose medium containing 50 mg/l of ioxynil and incubated at 25°C for 18-24 hr. The fungal suspension was inoculated in 18 ml of the same medium with ^{14}C-ring ioxynil or ^{14}C-cyano ioxynil. The degradation products were separated with silica gel, and identified by liquid chromatography. Ioxynil, degradation products from chromatograms and reference compounds were analyzed comparatively by UV spectroscopy. The degradation of ioxynil to CO_2 was found to proceed slowly in pure culture. The cyano-C of ioxynil was released as CO_2 at a faster rate than that of the ring-C. Two of the metabolites of ioxynil were identified as 3,5-diiodo-4-hydroxybenzamide and 3,5-diiodo- 4-hydroxybenzoic acid.

79-2071. Rao, P. S. C.; Davidson, J. M. (Soil Sci. Dep., Univ. Florida, Gainesville, FL 32611) **Absorption and movement of selected pesticides at high concentrations in soils.** *Water Res.* 13(4): 375-380; 1979. (21 references)

Webster silty clay loam from Iowa, Cecil sandy loam from Georgia, and Eustis fine sand from Florida were treated with 2,4-D, atrazine, terbacil, and methyl parathion at concentration rates ranging up to the aqueous solubility limit for each pesticide. Nonlinear Freundlich adsorption isotherms were obtained for nearly all soil-pesticide combinations. The Freundlich adsorption constant based on soil organic carbon was much less variable for a given pesticide among the four soils than was the constant based on total soil mass. In all cases studied the mobility for each pesticide was significantly greater at higher concentrations. Serious errors will be introduced if a linear adsorption isotherm is assumed when predicting pesticide transport from waste disposal sites where the chemicals are present in higher concentrations.

79-2072. Baird, R.; Selna, M.; Haskins, J.; Chappelli, D. (San Jose Creek Water Qual. Lab., Cty. Sanit. Dist. Los Angeles, Whittier, CA 90601) **Analysis of selected trace organics in advanced wastewater treatment systems.** *Water Res.* 13(6): 493-502; 1979. (22 references)

The quantity of trace organic compounds in th effluents of four different wastewater treatment systems was analyzed under several conditions. The trace organics were chosen based upon literature reports of their health and/or

environmental significance. Gas chromatographic methods were used in order to determine the quantity of organic compounds present in the various effluents. Tertiary treatment of effluent was evaluated for removal of trace organics by using combinations of flocculation, dual media filtration, and carbon adsorption. The effects of using ozone, free and combined chlorine residuals in the four treatment systems was also determined. Carbon adsorption was found to reduce trihalomethane levels by 90%. There were drastic increases in trihalomethane levels when free chlorine residuals were used in the treatment systems. Ozonation did not increase levels of trihalomethanes or the other organics studied. There were significant decreases in pesticide and PCB levels when carbon adsorption and chlorination were used in the treatment systems.

79-2073. Zakharov, E. V.; Konovalova, N. I. (Author address not given) **Vliianie tetraborata natriia na skotost' prevrashcheniia khlorofosa v vodnykh rastvorakh. [Effect of sodium tetraborate on the conversion rate of chlorophos in aqueous solutions.]** *Zh. Prikl. Khim. (Moscow)* 52(3): 706-707; 1979. (3 references) (Russian)

Characteristic features of degradation of the organophosphorus insecticide chlorophos (trichlorfon) was studied. It was found that sodium tetraborate causes rapid degradation of chlorophos in the aqueous medium.

See also 79-2002, 79-2021, 79-2087, 79-2135, 79-2208, 79-2246 *and* 79-2248.

79-2074. Siekel, P.; Greco, V.; Paulovova, J. (Inst. Exp. Pharmacol., Slovak Acad. Sci., Bratislava, Czechoslovakia) **Ucinok insekticidov na komare a niektore dalsie organizmy. [The effect of insecticides on mosquitos and on some other organisms.]** *Agrochemia* 19(2): 58-62; 1979. (5 references) (Slovak)

The effects of Metathion E50 (50% fenitrothion), Phosphothion (50% malathion), Decemthion (20% phosmet), Acetellic 50EC (50% pirimiphos methyl), Nuvanol N50 WP (50% iodophenphos), Nexion 40WP (40% bromophos) and Ficam W (80% bendiocarb) on the larvae and imagines of the mosquito *Culex* pipiens Forsk., the fly *Drosophil melanogaster*, the toad *Bufo bubo bufo* Linn. and the crustacean *Cyclops strennus strenuus* were investigated. The active substances were added to the cultivation media for the insects, and to the water for the other two species to determine the lethal concentrations on the specimens. The effect of the insecticides on the zoocenosis of the biotopes of the mosquitoes was also determined. The concentrations at which 100% of the toads and crustaceans were killed were plotted and revealed that the applications of wide-spectrum insecticides are lethal to non-target organisms at levels intended for mosquito control.

79-2075. Cloup, M.; Kaminski, M.; Brauner-Karray, R.; Goujard, J.; Cloup, I.; Chlabowitch, E.; Chassevent, J.; Lavaud, J. (Serv. Reanimat. Infant., Hop. Enfants Malades, F-75730 Paris 15, France) **Facteurs de gravite des intoxications chez les enfants admis dans les unites de soins intensifs. [Factors affecting the seriousness of intoxications of children admitted to intensive care units.]** *Arch. Fr. Pediat.* 36(2): 207-216; 1979. (4 references) (French)

Factors of poisoning accidents were evaluated from 854 case histories of children admitted to intensive care units of Paris hospitals. Of this number 67% were admitted for observation, 27% received routine intensive care, 6% were very seriously ill. Ninety-two percent were discharged completely recovered, 3% with minor after-effects, 3% with major after-effects, and 2% died following ingestion of *Amanita phalloides*. Composition of the the toxic substances involved included: drug 70%, agricultural and industrial chemicals 27%, and 3% poison mushrooms. Of the drugs barbiturates comprised 18%, imipramines 11%, opiates 7%, phenothiazine 7%, xanthines 6%, and salicylates 6%. The most frequent toxic substance of the agricultural and industrial chemicals was trichloroethylene. Iatrogenic infant poisoning and adolescent suicide attempts were more serious than cases of accidental poisoning. The age of the child, toxicity of the ingested subsance and interval between ingestion and treatment were of major importance in determining the outcome of each case.

79-2076. Plowright, R. C.; Pendrel, B. A.; McLaren, I. A. (Dep. Zool., Univ. Toronto, Toronto, Ontario M5S 1A1, Canada) **The impact of aerial fenitrothion spraying upon the population biology of bumble bees (*Bombus* Latr.:Hym.) in south-western New Brunswick.** *Can. Entomol.* 110: 1145-1156; 1978. (19 references)

Mortalities among bumble bees (*Bombus* spp.) exposed to aerial spraying of fenitrothion at the rate of 0.21 kg/ha ranged from 57.9% to 100% in dense and light forest canopy habitats, respectively. Mortalities of bees captured on the day after a spraying program were also high (65.6% dead after 1 wk), but the rate of death dropped to 20% among bees foraging 2 days after spray. Long-term effects of the pesticide were investigated by comparing late summer *Bombus* population densities among areas with various spray histories. Average bee densities within unsprayed areas were 3 times higher than in sprayed locations. Differences were especially pronounced ($p < 0.001$) for species emerging early form hibernation. Foraging performance by released bee colonies was significantly higher in sprayed areas with reduced populations ($p < 0.01$) than in control plots, possibly due to a decrease in competitive stress. The diversity of plant species used for pollen collection was twice as great in unsprayed areas.

79-2077. Spisak, B.; Pavkovcekova, O.; Kralik, M.; Beno, P. (Univ. Pavla Jozefa Safarika, Kosice, Czechoslovakia) **Neobvykle pripady intoxikacie talion. [Unusual cases of intoxication by thallium.]** *Cesk. Pediatr.* 34(3): 151-154; 1979. (6 references) (Slovak)

The clinical picture and therapy of 6 cases of thallium sulfate poisoning and results of autopsies of the two fatal cases are described. Children, 3-14-yr-old, ingested thallium sulfate treated eggs used for crow control. The immediate symptoms noted upon ingestion were abdominal pain, nausea and vomiting, and pain in the extremities. Upon admission the symptoms, noted as typical for thallium poisoning, included mental and neurological changes, corresponding abnormal clinical test results and in 1 case changes in the ECG. Therapy included diuresis, administration of penicillin po, and in 3 cases peritoneal dialysis. Two children died on day 29. Autopsy revealed failure of the cardiovascular and respiratory systems as the immediate cause of death. Diagnosis of thallium poisoning can be made by loss of hair and detection of thallium in the urine and feces. Flame atomic absorption spectrometry can be used to detected thallium in hair samples.

79-2078. Anonymous **Household insecticides: Which are worse, bugs or bug killers?** *Consumer Reports* 44(6): 362-367; 1979.

Ninety-seven household insecticides were evaluated for efficacy in killing household insects versus their potential for harm to humans and pets. Thirty-five of these products contained chemicals so potentially harmful that they were deemed unfit to be used in places where people would be living. With the other 62 products, extreme care must be exercised in their use and the label instructions followed precisely to avoid possible harm. Three types of space products were examined including foggers, aerosol mists, and liquid spray mists. Types active against crawling isects included aerosol sprays, liquid sprays, squirt-bottle liquids, powders, baits and bait traps, tape, and fumigant cakes. Specific chemi-

cals mentioned included: piperonyl butoxide, pyrethrins, MGK 264, resmethrin, MGK 974, d-transallethrin, chlorpyrifos, propoxur, methoxychlor and aliphatic thiocyanate, arsenates, sodium fluoride, dichlorvos, and diazinon. Chemical names are supplied for some of the common or trade names. A tabulation to be used to determine whether these products are safe for use in homes with pets, with pets and children, with pollen-sensitive people, with people seriously ill or on medication, and from the point of view of being fire hazards themselves is given.

79-2079. Goriainova, A. N.; Rubinskii, N. D.; Mnushkina, E. A.; Shcherban', N. G. (Med. Inst., Kharkov, USSR) **Obosnovanie predel'no dopustimoi konsentratsii meturina, fenilmetilmocheviny, fenilgidroksilamina v vode vodoenov. [Substantiation of maximal permissible concentrations of meturin, phenylmethylurea and phenylhydroxylamine in bodies of water.]** *Gig. Sanit.* 44(3): 68-70; 1979. (Russian)

The results of a complex evaluation of toxicity of Meturin (M), phenylmethylurea (PMU) and phenylhydroxylamine (PHA) are presented. The effect of chemicals on the properties of water was measured by the changes in the biochemical consumption of the oxygen and the processes of ammonification and nitrification of water. The maximum permissible concentrations were 1.0 mg/l for M, 0.1 mg/l for PHA, and 5.0 mg/l for PMU. The acute, subacute and chronic toxicity of the compounds was studied in albino mice, albino rats and rabbits. The LD50's after single po administration to mice, rats and rabbits for M were 795 mg/kg, 3,400 mg/kg and 3,200 mg/kg, for PMU 2,533 mg/kg, 4,410 mg/kg and 2,700 mg/kg, and for PHA 247 mg/kg, 100 mg/kg and 125 mg/kg, respectively. In chronic experiments, PHA at 0.01 mg/kg, M at 0.34 mg/kg and PMU at 1.0 mg/kg had no toxic effects.

79-2080. Bezuglyi, V. P.; Fokina, K. V.; Komarova, L. I.; Sivitskaia, I. I.; Il'ina, V. I.; Gorskaia, N. Z. (Inst. Toxicol. & Hyg. Pestic. Polym. & Plast., Kiev, USSR) **Klinika otdalennykh posledstvii ostrogo otravleniia 2,4-dikhloro fenoksiuksusnoi kislotoi. [Clinical manifestations of long-term sequels of acute poisoning with 2,4-dichloro phenoxyacetic acid.]** *Gig. Tr. Prof. Zabol.* (3): 47-48; 1979. (Russian)

A group of 11 female field workers who had developed symptoms of acute poisoning after exposure to the herbicide 2,4-dichloro pheoxyacetic acid (2,4-D) were followed-for 2 yr. At the initial examination the patients complained of periodic headache, vertigo (7), fatigue, numbness and pain in legs and arms, irritability (5) and partial amnesia (2). All patients had cardiac pain, six patients featured palpitation and five had marked dyspnea. Within 1-1.5 mo of poisoning 9/11 patients developed oligomenorrhea (in 7 women the menstrual cycle normalized within 5-6 mo). Six patients had mono- and lymphocytosis, while all patients had statistically significant decreases in the activity of a series of oxidative enzymes of the peripheral blood leukocytes. Two patients had chronic toxic hepatitis, 9 developed encaphalopolyneuritis, myocardiodystrophy and vascular dystonia, and 8 patients had chronic conjunctivitis.

79-2081. Bolotnyi, A. V.; Alekhina, S. M.; Aslanian, G. Ts. (Inst. Hyg. & Toxicol. Pestic. Polym. & Plast., Kiev, USSR) **Issledovanie aktivnosti kholinesterazy v krovi liudei kontaktiruiushchikh s fosfororganicheskimi pestitsidami. [Analysis of cholesterase activity in blood of persons who had an exposure to organophosphorus pesticides.]** *Gig. Tr. Prof. Zabol.* (3): 51-52; 1979. (7 references) (Russian)

The activity of blood cholinesterase (ChE) was studied in agricultural workers who had occupational exposure to several organophosphorus pesticiding including, methylmercaptophos, (oxydemeton-methyl), Intrathion (thiometon), chlorophos (trichlorfon), phosalone, bromophos, metaphos (methyl-parathion) and Rogor (dimethoate). Exposure to metaphos caused 21% ChE inhibition. The other chemicals examined caused insignificant changes in the ChE activity. The isozyme spectra of ChE indicated that a 10-45 day exposure to organophosphates would cause a significant increase in the activity of the fast fractions of ChE.

79-2082. D'iachuk, I. A. (Med. Inst., Kishinev, USSR) **Sostoianie immunobiologicheskoi reactivnosti organizma rabotnikov indeikovodcheskikh ptitsefabrik. [State of immunological reactivity of workers of turkey farms.]** *Gig. Tr. Prof. Zabol.* (4): 53-55; 1979. (Russian)

Immune reactivity was evaluated in workers of two large turkey farms. The workers had occupational exposure to dust, gases, water vapors and microflora as well as some agricultural chemicals. It was found that workers had a significantly decreased phagocytic index (1.24-1.35, compared with 1.91 in control group), significantly increased microflora of the skin (76.66-78.33% bacteria present compared to 49.0% in controls) and a significantly decreased level of vitamin C in the urine (0.29-0.37 mg/hr, compared with 0.8 mg/hr in controls).

79-2083. Saxena, K. L.; Chakrabarti, T. (Natl. Environ. Eng. Res. Inst., Nagpur 440020, India) **Organic pesticides and their removal from aqueous system.** *Indian J. Environ. Health* 20(4): 334-353; 1979. (23 references)

Effluent from pesticide manufacturing plants in India is classified by type, as either organic or inorganic, and the chemical characteristics of the polluted water are discussed. The biological hazards and toxicity data of organic pesticides, such as carbaryl, parathion, malathion, 2,4-D, 2,4,5-T, and several organochlorine insecticides, are listed in terms of identifiable odors, persistence in years, and 'no-effect' levels in rats. Maximum allowable concentrations in marine water effluent and surface and drinking waters are tabulated. Current methods employed in removal of these pesticides from wastewater are discussed including carbon adsorption, chlorination, ozonation, and coagulation and filtration. Results of biological degradation studies are also discussed. Means of disposal of concentrated, semi-solid and solid pesticide wastes in India are described.

79-2084. Potashnik, G.; Yanai-Inbar, I.; Sacks, M. I.; Israeli, R. (Infert. Univ, Dep. Obstet. & Gynecol. A, Inst. Pa-

thol., Soroka Univ. Hosp., Beersheba, Israel) **Effect of dibromochloropropane on human testicular function.** *Isr. J. Med. Sci.* 15(5): 438-442; 1979. (6 references)

Testicular function was evaluated among 23 employees exposed to DBCP in a manufacturing plant. The physical examination was unremarkable in each case. Routine lab tests, blood tests, renal and hepatic functions were all normal. Azoospermia was diagnosed in 12 workers between 20 and 50-yr-old, each of whom was directly involved in the production process. Exposure time for these men ranged between 100 and 6726 hr. In five cases the last exposure was 1-5 yr prior to this study. Oligospermia was noted in 6 employees with exposure times from 34 to 95 hr. Plasma FSH levels were significantly higher in those individuals involved in the production process. Levels ranged from 13.4 to 30.0 mIU/ml. This study indicated a close correlation between exposure time and sperm density. It appeared that DBCP is a potent testicular toxin even after relatively short-term exposures.

79-2085. Bendix, S. (Dep. City Planning, Cty. San Francisco, San Francisco, CA 94102) **Firefighter exposure to environmental carcinogens.** *J. Combust. Toxicol.* 6: 127-135; 1979. (44 references)

Various chemicals, encountered by firefighters in the course of their job, are discussed as they relate to possible increased incidences of cancer among this group. Several pesticides are known to be carcinogens, including chlordane, heptachlor, aldrin, dieldrin, mirex, chlordimeform, endrin, chlorobenzilate, DDT, BHC, dimethoate, and the ethylene bis dithiocarbamates. Pesticides are not limited to locations in factories or places of production, but are also found in most homes and buildings. Even pesticides which are no longer marketed can be located in these places. The effects on the firefighter from these inhaled carcinogens is recommended as an area for further study.

79-2086. Caron, D. M. (Dep. Entomol., Univ. Maryland, College Park, MD 20742) **Effects of some ULV mosquito abatement insecticides on honey bees.** *J. Econ. Entomol.* 72(1): 148-151; 1979. (13 references)

Specimens of *Apis mellifera* L. were caged at measured distances and placed at random locations in cages and at bee colonies in Maryland communities receiving ULV malathion, pyrethrum, and naled sprays for control of adult mosquitos. ULV and conventional mist blower applied dilute malathion resulted in extensive losses of caged bees except at 300 m distance. Night application ULV malathion had no discernible effect on the bee colonies nor did the other 2 ULV formulations. Day application of either conventionally diluted or ULV malathion resulted in consistent losses to bee colonies in communities receiving adult mosquito sprays. (Author abstract by permission)

79-2087. Zinkl, J. G.; Rathert, J.; Hudson, R. R. (Denver Wildl. Res. Cent., US Fish & Wildl, Serv., Denver, CO) **Diazinon poisoning in wild Canada geese.** *J. Wildl. Manage.* 42(2): 406-408; 1978.

A case of poisoning of Canada geese is reported. Concentration of diazinon in the grass on which they fed was 20 ppm. ChE activity was depressed in the brains of the dead birds, as compared to controls. It was concluded that the cause of death was diazinon. The effect of storage temperature on ChE was tested. A 19 to 22% deterioration of ChE activity occurred when the brains were allowed to warm up to 2°C, whereas brains maintained at -50°C had no deterioration of ChE.

79-2088. Andriukin, A. A. (Dep. Ther., I. M. Sechenov Med. Inst. I, Moscow, USSR) **Toksicheskoe deistvie dikhloretana na serdechno sosudistuiu sistemu. [Toxic effect of dichloroethane on the cardio-vascular system.]** *Klin. Med. (Moscow)* 57(1): 43-47; 1979. (25 references) (Russian)

The functional state of the cardio-vascular system was studied in 27 patients (21 men, 6 women; 19-49-yr-old) with acute dichloroethane (ethylene dichloride) poisoning. Three patients had inhaled dichloroethane and 24 had swallowed from 10-20 ml to 100 ml of dichloroethane. The patients were diviided into two groups. Group 1 consisted of 17 patients with light and mild poisoning and group 2 consisted of 10 patients who were in coma. Clinical manifestations of dichloroethane poisoning in group 1 included headache, vertigo, abdominal pain, nausea and vomiting; 5 patients had hepatomegaly, icteric skin, sclera, and increased bilirubin levels (to 2.0-2.5 mg%). Examination of the cardiovascuar system revealed an increased rate of cardiac contraction (92 beats/min, compared with 72 beats/min in healthy controls), decreased minuted volume (3.82 l/min, compared with 4.7 l/min in controls), decreased volume of circulating blood (2.43 l/m^2) and decreased cardiac index (2.2 l/min/m^2 vs 2/83 l/min/m^2). The patients in group 2 had more pronunced symptoms of cardiac insufficiency. There was a further increase in the rate of cardiac contraction (to 107 beats/min), decrease in the minute blood volume (3.5 l/min), decrease in the volume of circulating blood (1.91 l/m^2), and decrease in the cardiac index (2.04 l/min/m^2).

79-2089. Rathus, E.; Stinton, R. G.; Putman, J. L. (Dep. Health, Brisbane, Queensland 4000, Australia) **Arsine poisoning, country style.** *Med. J. Aust.* 1(5): 163-16; 1979. (9 references)

Case studies of one adult and eight children who suffered arsine poisoning are presented. The subjects passed blood in the urine after exposure to cattle dip containing chlorphenamidine and superphosphates during the cleaning of vats in their bare feet. Abdominal pain and dysuria were also noted in several of the children. The patients were transferred to a larger hospital shortly after their admittance to their local hospital, due to the possibility of extensive renal damage upon exposure to arsenicals. Arsenic-containing dip had been used in the vats 2 yr prior to this incident, and samples of mud from the bottom of the vats and urine samples from the patients showed traces of arsenic. Safety meas-

ures for handling arsenic-containing pesticides are suggested in light of the present findings of the high toxicity of these compounds when arsine exposure is possible.

79-2090. Mayama, S.; Haneda, T.; Shimazu, W.; Sato, H.; Makino, E.; Yajima, T.; Kumakura, M.; Obata, H.; Hattori, T. (Dep. Intern. Med., Shibata Prefect. Hosp., Shibata, Niigata, Japan) **[A case of acute intoxication due to paraquat dichloride.]** *Nippon Naika Gakkai Zasshi (J. Jpn. Soc. Int. Med.)* 68(5): 559-560; 1979. (Japanese)

A 40-yr-old man swallowed 30 ml of 24% paraquat dichloride accidentally and was hospitalized after 3 days complaining of mouthache and difficulty in swallowing. Consciousness was normal and blood pressure was 112/60 mm Hg without cyanosis. Body temperature was 36.3°C. He was treated by a large amount of fluid supplementation, peritoneal lavage, and antibiotics and diuretics. On the 7th day of hospitalization, after finding an abnormal shadow on the chest roentgenogram, predonisolone and Vitamin E were administered. From the 10th hospital day he could take a liquid diet. Paraquat in his urine became negative after 3 wk. Erosion of the oral cavity disappeared after 50 days. He was released from the hospital after 2 mo, and was well at 6 mo after the intoxication. Results of examination just after hospitalization were: albuminuria (+), blood normal, liver GOT 36, GPT 19, and LDH 505, alkaline phosphatase 14.4, γ-GTP 220, serum electrolytes normal, urea-nitrogen 72.0 mg/dl, creatinine 8.1 mg/dl, ECG and chest roentgenogram normal, CPP 5(+), and ESR 21 mm/1 hr and 45 mm/2 hr.

79-2091. Garnier, R.; Cloup, M. (Cent. Anti-poisons Paris, Hop. Fernand-Widal, Paris, France) **Les intoxications par produits de maison - donnees numeriques. [Poisoning by household products - numerical data.]** *Rev. Prat.* 29(15): 1305-1306, 1317; 1979. (French)

Toxic accidents, caused by the intake of household products, constitute 20-30% of all acute intoxications, involve predominantly children (30% of all accidents compared to 17% of adult accidents) and have usually a benign outcome. These toxic accidents are caused by such substances as detergents (19%), bleach (13%), cosmetics (11%), household plants (5%), solvents (5%), insecticides and deodorants (5%), plant food (3%), paint (3%), and adhesives (3%). According to statistics of the Paris Poison Control Center, fewer than 10% of the cases involving adults and 5% involving children require resuscitation. The accidents are much less serious than drug-poisoning cases and are almost always accidental. Still, prevention should be intensified by proper labeling of such products and by public education.

79-2092. Breaud, Ph.; Schneider, C.; Galland, C.; Russ, D. (Serv. Med., Hop. St. Loup, CH-1349 Pompaples, Switzerland) **Un cas de polyneuropathie aigue toxique chez un jeune agriculteur. Discussion des problemes diagnostiques poses dans le cadre d'un service de medicine interne. [Case hisory of acute toxic polyneuropathy in a young farmer. Discussion of diagnostic problems encountered in an internal medicine department.]** *Rev. Med. Suisse Romande* 99(3): 149-154; 1979. (6 references) (French)

A young farmer was hospitalized after disabling pains of the ankles which extended to the toes and calves, failed to disappear after treatment with corticoids. A neurological examination, including analysis of the cephalorachidian fluid and electromyogram led to the diagnosis of toxic polyneuropathy attributed to organophosphorus compounds. The patient had been handling these compounds before the appearance of the symptoms. Relief of the maladay was obtained after the administration of heavy doses of vitamins B1 and B6. After a few days the paresthetic symptoms disappeared. Two months later, the electromyogram was normal. Due to the similarity of symptoms, toxic polyneuropathy can easily be misdiagnosed as the Guillain-Barre syndrome.

79-2093. Shugrin, S. N. (Author address not given) **Mery bezopasnosti pri rabote s iadokhimikatami. [Safety measures during the work with pesticides.]** *Sakh. Svekla* (4): 38; 1979. (Russian)

The basic safety measures required for working with pesticides are reviewed. It is emphasized that pesticides should be stored no nearer than 200 m from dwellings. Disposable packages should be burned and reusable containers should be decontaminated. All workers should wear special protective clothes, respirators and protective gloves and glasses. It is forbidden to drink water or to smoke at the sites of pesticides application. All workers who have an occupational exposure to pesticides should undergo semiannual medical examinations.

79-2094. Nelson, C. J.; Holson, J. F.; Green, H. G.; Gaylor, D. W. (Div. Biom. & Teratol., Natl. Cent. Toxicol. Res., US DHEW, Jefferson, AR 72079) **Retrospective study of the relationship between agricultural use of 2,4,5-T and cleft palate occurrence in Arkansas.** *Teratology* 19(3): 377-384; 1979. (30 references)

The relationship between use of the herbicide 2,4,5-T in Arkansas and the concurrent incidence of facial clefts in children was studied retrospectively. Pertinent animal studies of the toxicity of 2,4,5-T and related compounds were reviewed; embryotoxic and teratogenic effects including cleft palate, have been noted in several mammalian species. Although newspaper articles appeared linking defoliant use with increased birth anomalies in South Vietnam in 1969, human epidemiology studies have not established a causal relationship between use of 2,4,5-T and birth defects. We felt that additional information concerning the human problem was needed to complement the experimental animal data, so we analyzed facial cleft rates and concurrent estimated use of 2,4,5-T in Arkansas during 1948-1974. Estimated levels of exposure to 2,4,5-T were determined by categorizing the 75 Arkansas counties into high-, medium-, or low-exposure groups on the basis of their rice acreage during 6- or 7-yr intervals beginning in 1943. A total of 1,201 cases of cleft lip and/or cleft palate for these 32 yr was detected by screening

birth certificates and checking the records of the Crippled Children's Services. Facial cleft rates, presented by sex, race, time period, and exposure group, generally rose over time. No significant differences were found for any race or sex combination. We believe that the general increase seen in facial cleft incidence in the high- and low-exposure groups is attributable to better case finding rather than maternal exposure to 2,4,5-T. (Author abstract by permission)

79-2095. Vocke, G.; Heady, E. O. (Cent. Agric. & Rural Dev., Iowa State Univ., Ames, IA 50011) **Impact of pesticide restrictions on regional production patterns.** *Water Air Soil Pollut.* 10(1): 105-114; 1978. (6 references)

The effects of the ban on chlordane and heptachlor from use in the US agricultural program are considered by means of a national and interregional programming model. Analytical steps in this procedure allow for the identification of various changes in the production practices on individual farms needed to comply with the restrictions, for the study of changes in regional crop production patterns which reflect shifts in comparative advantage created by these restrictions, and for an accounting of the use of available rssources in the agricultural program. The potential impact of the ban is reviewed in terms of its effects on crop production patterns, regional crop and livestock production patterns, and changes in the costs of production. A conclusion from this study was that in the Corn Belt the ban caused a substitution of corn with soybeans and small grains on lowlands due to th ineffectiveness of substitute insecticides against cutworms.

79-2096. Anonymous **Gesetze und Verordnungen. [Laws and decrees.]** *Z. Lebensm. Unters. Forsch* 168(45): 353-358; 1979. (German)

The draft implementation order to the Decree on Nutritional Information prepared by the Food and Forensic Chemistry Committee of the German Chemical Society contains guidelines for the determination of the mean physiological caloric value of all edible foods and the mean content of carbohydrates, fats and proteins, and outlines the analytical methods to be use in these determinations. Decree (EEC) No. 3076/78 on the importation of hops and hop products into Germany from the USA, Poland, Bulgaria, Yugoslavia, the Peoples Republic of China, Czechoslovakia and Australia is a guideline for the preparation of certificates which must accompany each such shipment. Guideline (79/117 EEC) contains a list of pesticides with certain active agents which must be marketed and used. The Decree of the Swedish Federal Food Administration is concerned with the maximum permissible levels of food contaminants. Plastics that may be used are included within the scope of the Food and Utensils Law.

See also 79-2002, 79-2005, 79-2009, 79-2010, 79-2021, 79-2014, 79-2022, 79-2023, 79-2041, 79-2058, 79-2099, 79-2137, 79-2149, 79-2213, *and* 79-2247.

79-2097. Zemanova, M.; Drobnicova, I. (Dep. Microbiol., Fac. Nat. Sci., Univ. Komenskeho, Bratislava, Czechoslovakia) **Characterizacia biocidneho ucinku znamych a novych pesticidov na rozne typy prokariotickych a eukariotichych buniek. [Characteristics of the biocidal effect of known and new pesticides on different types of prokaryotic and eukaryotic cells.]** *Acta Fac. Rerum Nat. Univ. Comenianae Form Prot. Nat.* 3: 249-255; 1978. (7 references) (Slovak)

Examples are given for characterizing the biocidal properties of fungicides, insecticides, herbicides, detergents, industrial wastes, and other toxic substances. The determination of the antimicrobial activity of pentachlorophenol (PCP) on *Staphylococcus aureus, Escherichia coli, Aspergillus niger, Saccharomyces cervisiae, Euglena gracilis* and *Chlorella pyrenoidosa* is discussed. The effect of various pentachlorophenol concentrations on respiration and proliferation of *Candida albicans*, and the effect of sulfur-containing fungicides (zinc dimethyl dithiocarbamate, tetramethyl thiuram disulfide, 2-mercaptobenzothiazol) on 11 microorganisms is also given. The necessity of applying unified method sand standards is stressed.

79-2098. Pawlaczyk-Szpilowa, M.; Lejczak, B. (Inst. Environ. Techn., Tech. Univ. Wroclaw, Wroclaw, Poland) **Studies on the influence of chlorphenvinphos, carbaryl and propoxur on the enzymatic activities of bacterial species isolated from water.** *Acta Hydrochim. Hydrobiol.* 6(4): 341-352; 1978. (16 references)

Azotobacter agilis, Bacillus megaterium and *Brevibacterium* sp. were exposed to test doses of chlorfenvinphos, carbaryl and propoxur at levels of 0.02, 0.05, 0.1, 0.2, 0.4, 0.6, 0.8, 1.0 and 2.0 g/l. The phosphatase and dehydrogenase of the respiration cycle of the bacteria were inhibited by these exposures. The catalytic function of catalase was seriously disrupted. The most notable effect was on the phosphatase activity of bacteria. The inhibition of these phosphatases may cause an unfavorable balance of the phosphorus regime in water reservoirs by making the mineralization of organophosphorus compounds more difficult.

79-2099. Varkonda, S.; Konecny, V.; Steskal, R.; Cerey, K. (Res. Inst. Agrochem. Technol., Bratislava, CSSR) **Perspektivny podny insekticid na baze zmesnych derivatov chlormefosu. [A promising soil insecticide on the basis of mixed chlormephos derivatives.]** *Agrochemia* 19(2): 33-36; 1979. (7 references) (Slovak)

The acute oral toxicity of 10 different mixes of chlormephos derivatives to warmblooded animals (rats) was compared with that of standard chlormephos (*o,o*- diethyl-S-chloromethyl dithiophosphate). The insecticidal and acaricidal effect of the formulations on wire worms was determined under laboratory and field conditions. Results revealed that acute oral toxicity of all the different mixes was lower (20 to 340 mg/kg body weight) than the acute oral toxicity of chlormephos (7 mg/kg). All mixes are suitable for use as fumigants with somewhat lower effectiveness compared with chlormephos. Field tests with one mix yielded 100% control of wire worms at an active final soil concentration of 0.0012% which is comparable to the result achieved with chlormephos or pyridathion. The control effect lasted for 8 wk. The considerably lower LD50 of the mix compared to that of chlormephos is a clear advantage over chlormephos for personnel handling the soil disinfectant.

79-2100. Oshima, H.; Nishimura, H.; Nishimura, N. (Sch. Hyg., Aichi Med. Coll., Nagoya, Aichi, Japan) **[Studies on the acute toxicity of paraquat dichloride.]** *Aichi Ika Daigaku Igakukai Zasshi (J. Aichi Med. Univ. Assoc.)* 7(1): 52; 1979. (Japanese)

The subacute toxicity of paraquat dichloride was studied in 5 groups of male Wistar rats (5 rats per group). Rats were given the pesticide orally in doses of 0, 5, 10, or 20 mg/kg 2 times/wk for 1 mo. No difference in body weight gain was observed among the groups. A reduction in serum GOT, GPT, and LDH was found in proportion to the amount of pesticide administered, with significant increases in groups receiving 10 and 20 mg/kg. Liver weights of the 20 mg/kg dose group showed a significant reduction. Macroscopically, the lungs of the paraquat treated groups were grayish-white in color with scattered brownish-black stops. Microscopically, a thickening of alveolar septum accompanied by fibroblasts, macrophages, and monocytes was noted in some animals of the 20 mg/kg dose group.

79-2101. Hazelwood, J. C.; Stefan, G. E.; Bowen, J. M. (Div. Vet. Med. Res., US FDA, Beltsville, MD 20705) **Motor unit irritability in beagles before and after exposure to cholinesterase inhibitors.** *Am. J. Vet. Res.* 40(6): 852-856; 1979. (18 references)

Beagles were exposed to one of a variety of organophosphate compounds for a 7 day period. The compounds and their dosages were: ronnel at 55.0 or 110.0 mg/kg, dichlorvos at 29.7, 59.4, or 148.5 mg/kg, or cythioate at 24.8 or 33.0 mg/kg. No effect of ronnel on ChE activity was noted. On the other hand, inhibition of ChE activity was noted with dichlorvos and cythioate. An increased duration of evoked potentials in the EMG readings was significant. No change was noted on reflex motor unit potential activity nor on nerve conduction velocities. The study suggests that when erythrocyte ChE activity was significantly reduced, inhibition of ChE activity at the motor end plate was not sufficient to permit accumulation of the neurotransmitter. It is suggested that the muscle fasciculation which accompanies organophosphate poisoning may reflect increased irritability of neurons in the central nervous system.

79-2102. Roux, F.; Guillam, C.; Bescol-Liversac, J. (Author address not given.) **Pathologie toxique de l'hepatocyte en culture histiotypique. II Action d'un organochlore: le lindane. Effet de substance estrangere metabolisble et effet toxique. [Toxic pathology of the hepatocyte in histotypic culture. II. Action of lindane, an organochlorine. Metabolizable xenobiotic effect and toxic effect.]** *Ann. Anat. Pathol.* 23(4-5): 253-275; 1978. (French)

The effects of various concentrations of lindane upon primary cultures of chick embryo hepatocytes during 40 hr incubations were investigated. Lindane was dissolved in dimethylsulfoxide prior to introduction to the culture medium. Control cultures were maintained with the same solubilizing agent at 2 g/l. Doses of lindane at 0.5, 1, 5, and 10 μ mol/l caused no cytological changes but did cause a drop in the activity of acid phosphatase (ACP). Doses of 25 or 50 μ mol/l resulted in mitochondrial swelling and discreet hyperplasia of the endoplasmic reticulum. Growth did not vary noticeabley. ACP activity remained lowered. At doses of 75, 100 or 125 μmol/l, the cells continued to enlarge while showing progressive deterioration. Biosynthesis decreased. ACP activity decreased then began to rise slowly with increasing insecticide concentration. High doses of lindane (150 or 175 μmol/l) greatly curtailed development of the cultures. The deformed hepatocytes showed advanced lesion (spiraling ruptures of the hyaloplasm) along with degradation of all organelles. The dicytolysosomal system was also markedly affected. ACP activity reached 50% of control value at 175 μ mol/l. Growth was arrested and a lethal effect was noted at doses of 200 or 250 μmol/l. The significance of the perturbations caused by lindane are discussed.

79-2103. Leonardi, G. (Div. Med. Gen., Osp. Gen. Prov. S. Andrae, Vercelli, Italy) **Raffronto fra l'azione anticolinesterasica *in vitro* della tossina tetanica e quella del parathion. [Comparative study between cholinesterase inhibition *in vitro* by tetanus toxin and parathion.]** *Ann. Sclavo* 20(5): 643-646; 1978. (8 references) (Italian)

Rabbit brain homogenates were used to determine cholinesterase (ChE) inhibition. *In vitro* incubations were performed at 37°C for 30 min with 0.2, 0.4 or 4 ml tetanus toxin or 1 or 2 mg of parathion. The ChE inhibitory effect of 4 ml of tetanus toxin was equivalent to that noted for 1 mg parathion.

79-2104. Leonardi, G. (Div. Med. Gen., Osp. Gen. Prov. S. Andrea, Vercelli, Italy) **Fenomeno di interferenza fra tossina tetanica e parathion nell'intossicazioe dperimentele dell-'animals. [Interference between tetanus toxin and parathion in experimental intoxication of animals.]** *Ann. Sclavo* 20(5): 647-653; 1978. (24 references) (Italian)

Three groups of guinea pigs were injected variously with a tetanus toxin solution, a parathion solution or with both solutions. All animals in the first group died within 6-52 hr, those in the second group within 4-5 hr, while animals in the groups showed attenuated tetanus symptoms but lived. This represents an interference between the two cholinesterase inhibitors resulting in the inactivation of the Wassermann and Takaki phenomenon. It is concluded that both substances act on the same enzymatic system, the cholinesterase of neural tissues.

79-2105. Leonardi, G.; Gazzei, G.; Zanierato, G. (Div. Med. Gen., Osp. Gen. Prov. S. Andrea, Vercelli, Italy) **Possibile interferenza tra tossina tetanica ed esteri organofosforici nel blocco della colinesterase. [Possible potential crossing effect between tetanus toxin and organophosphorus compounds in cholinesterase inhibition.]** *Ann. Sclavo* 20(5): 664-670; 1978. (13 references) (Italian)

The potential crossing effects between tetanus toxin and the organophosphate parathion was examined. The cholinesterase inhibition in rabbit brain homogenates were determined by incubating two samples of brain homogenate with parathion and two samples with tetanus toxin. Cholinesterase activity was determined potentiometrically. Subsequently, two samples containing both toxic agents were incubated and the ChE activity was again determined. The inactivation mechanism was identified as a lipid linkage with either the tetanus toxin or parathion. Incubations of brain homogenate with first one agent and later the other resulted in the latter agent maintaining its toxicity. This was interpreted to be the result of linkage of the first agent with cholinesterase preventing the other substance from being inactivated.

79-2106. Lipp, J. A.; Dola, T. J. (Biomed. Sect., Defence Res. Establish., Ralston, Alberta, Canada) **Effect of atropine upon the cerebrovascular system during soman-induced respiratory depression.** *Arch. Int. Pharmacodyn. Ther.* 235(2): 211-218; 1978. (12 references)

A study was done on the effect of soman-induced respiratory depression upon cerebral vascular physiology. Five male and female rhesus monkeys were anesthetized with sodium pentobarbital. Dural electrodes were then implanted bilaterally over the superior frontal, pre-central and post-central gyri and secured with acrylic cement. After a two week recovery period, a polyethylene tube was inserted through one femoral artery into the descending aorta for recording MABP. One femoral vein was catheterized to permit intravenous infusion. Intracranial venous pressure (ICVP) was recorded by means of a catheter wedged into the superior sagittal sinus. Soman was diluted with 0.9% saline and administered by im injection into the thigh of the monkey. The dose of soman ranged from 20-25 μg/kg. Atropine was administered by iv injection when the monkey exhibited severe dyspnea or apnea. There was a significant decrease in heart rate, mean arterial blood pressure, cerebral blood flow and cerebral perfusion pressure during the onset of respiratory depression. Administration of atropine increased the cerebral blood flow and cerebral perfusion pressure, and reversed the anoxic conditions resulting in the improvement of respiration.

79-2107. Wright, A. S.; Hutson, D. G.; Wooder, M. F. (Sittingbourne Res. Cent., Shell Toxicol. Lab., Shell Res. Ltd., Sittingbourne, Kent ME9 8AG, England) **The chemical and biochemical reactivity of dichlorvos.** *Arch. Toxicol.* 42(1): 1-18; 1979. (73 references)

The chemical structure, reactivity and metabolite fate of the insecticide dichlorvos (2,2-dichloro vinyl dimethyl phosphate) are discussed in relation to the possible genotoxicity of this and other methyl phosphate triesters. Recent at-

tempts to demonstrate the methylation of DNA following exposure to bacteria and animals to dichlorvos are reviewed. On the basis of comparative data relating mutagenisis to methylation reactions, it seems entirely appropriate to conclude that the mutagenicity of dichlorvos to bacteria is due solely to methylation of the bacterial DNA under the conditions of these tests. However, the methylation of mammalian DNA could not be demonstrated under realistic exposure conditions (when the alkylating mutagen methyl methanesulphonate afforded clearly measurable methylation). The failure to detection methylatio by dichlorvos *in vivo* is attributed to the operation of highly efficient enzyme-catalysed biotransformations which rely largely on the phosphorylating reactivity of dichlorvos. The biotransformation pathways, characterized mostly in the rat, appear to be common also to pig, mouse, hamster, and man. (Author abstract by permission)

79-2108. Koss, G.; Koransky, W.; Steinbach, K. (Inst. Toxicol. & Pharmacol., Philipps Univ., D-3550 Marburg, BRD) **Studies on the toxicology of hexachlorobenzene. IV. Sulfur-containing metabolites.** *Arch. Toxicol.* 42(1): 19-31; 1979. (20 references)

After administration of hexachlorobenzene, rats excrete sulfur containing conjugates from which pentachloro thiophenol can be split off. In the present study we describe the identification of pentachloro thiophenol and pentachloro thioanisol in the livers of animals treated with hexachlorobenzene. In order to clarify their further fate, these two substances were administered to rats and the conversion products excreted in the urine and feces were isolated. The metabolites of pentachloro thiophenol and pentachloro thanisol are excreted in both conjugated and free form. From extracts of the excreta, tetra- and trichlorobenzene with two or three sulfur containing substituents on the ring were isolated, analogous compounds in which thiol groups were converted into sulfoxide and sulfone groups, as well as analogous compounds with a phenolic oxygen in addition to sulfur, and sulfur-containing compounds in which chlorine was replaced by hydrogen. Following administration of the sulfoxide and of the sulfone of pentachloro thioanisol under analogous conditions, pentachloro thiophenol and pentachloro thioanisol and their metabolites were detected in the excreta of the animals. No evidence was obtained that the parent compounds are excreted in the unchanged form. (Author abstract by permission)

79-2109. Unglaub, W. (Staatl. Tieraerztl. Untersuchungsamt, Aulendorf, BRD) **Feldversuch zur Beschleunigung der Pestizidausscheidung (Hexachlorbenzol) bei Milchkuehen. [A field experiment designed to accelerate pesticide elimination (HCB) in milk cows.]** *Arch. Lebensmittelhyg.* 30(2): 48-50; 1978. (5 references) (German)

A field test was conducted with 14 cows whose milk contained 2.5 ppm HCB (hexachlorobenzene). To accelerate the elimination of the pesticide cows were fed energy-short rations for 6 wk, followed by daily feeding of 500 mg phenobarbital plus 2 mg L-thyroxine plus 500 g activated carbon for 10 days and 2 mg L-thyroxine plus 500 g activated carbon for an additional 20 days. This is similar to the method used to accelerate elimination of other insecticides. The difference in the HCB concentration in milkfat at the conclusion of the experiment was significant (around 14%).

79-2110. Iturri, S.; Ringer, R. (Dep. Biol., Fac. Cienc., Univ. Chile, Seda Oriente, Chile) **Cambios cardiovasculares y hematologicos en la gallina White Leghorn despves dela exposicion a dosis cronicas y agudas de DDT y endrin. [Cardiovascular and hematological changes after chronic and acute exposure to endrin and DDT in the domestic fowl.]** *Arch. Biol. Med. Exp.* 11(3): R22-R23; 1978. (Spanish)

The effects of chronic and acute doses of DDT and endrin on several cardiovascular and hematological parameters in the adult White Leghorn hen were observed. Chronic doses of DDT (500-2000 ppm) and endrin (8-20 ppm) were added to the diet. In the study of acute doses, endrin (8 mg/kg), dissolved in ethanol, was introduced through the brachial vein. There were no changes in the hen blood pressure, heart rate or blood pH. The hematocrit value and hemoglobin concentration showed a significant drop after the ingestion of DDT. In the same conditions, endrin achieved an opposite result: a noticeable increase in the hematocrit value and the hemoglibin concentration. The acute doses of endrin led to hypertension and bradycardia, with convulsions and excessive salivation. DDT in chronic doses seemed to inhibit the production of erythrocytes while endrin stimulated it. In acute doses, the administration of endrin apparently resulted in an excitation of the autonomic nervous system.

79-2111. Iturri, S.; Rojas, C.; Bergqvist, M.; Calaf, G.; Massa, M. (Dep. Biol., Fac. Cienc., Univ. Chile, La Platina, Chile) **Effeetos de difenilos policlorados y DDT en la hematologia del pollo (*Gallus domesticus*) y codorniz japonesa (*Coturnix coturnix japonica*). [Effects of polychlorinated biphenyls and DDT on the hematology of White Leghorn cockerel (*Gallus domesticus*) and the Japanese quail (*Coturnix coturnix japonica*).]** *Arch. Biol. Med. Exp.* 11(3): R81-R82; 1978. (Spanish)

This study seeks to demonstrate that prolonged ingestion of DDT or polychlorinated biphenyls (PCB) induces anemia in domestic fowl. Adult, male Japanese quails received PCB 1242 and 1254 (75-300 ppm) for 56 days. From birth onwards, male White Leghorn chicks received DDT (0.10 and 100 ppm) over a period of 108 days or a combination of PCB (75 ppm) and DDT (0.5, 10, 30 and 50 ppm) for 49 days. At the end of the experiment, the effects of the compounds on several hemotological parameters were investigated. In comparison with the control groups, the hematocrit value and hemaglobin concentration showed a significant drop after the introduction of DDT into the quail diet. There was a noticeable decrease in hematocrit value, hemoglobin concentration and total erythrocyte concentration in chicks receiving 100 ppm DDT. PCB, alone or in conjunction with DDT, also caused a definite reduction in the values of the same parameters. These results indicated that DDT and PCB

participated in the production of anemia in both species. At the doses used, the combination of PCB and DDT did not seem to play a synergic role in the induction of the anemia.

79-2112. Ramirez, A.; Dinamarca, M. L.; Valdes, E.; Salinas, P. (Dep. Bioquim., Fac. Med., Univ. Chile, Santiago, Chile) **Estudio comparativo de DDT-dehidroclorinases. [Comparative studies of DDT-dehydrochlorinases.]** *Arch. Biol. Med. Exp.* 11(3): R97; 1978. (Spanish)

The physical, chemical and specific properties of DDT-dehydrochlorinase substrates were compared. The enzyme was isolated from three separate strains of domestic fly with various levels of resistance to DDT (WWHO, F, and P/sel). The P_2/sel strain showed the greatest activity in the presence of DDT and analog. The WHO strain seemed the least active. In a comparison of the DDT-dehydrohalogenation and GSH-oxidation activities, the F*c* strain presented the greatest reaction value. DDT-ases underwent a process of association-dissociation. The respective monomers appeared to be identical in molecular weight with isoelectric points of 5.8 (WHO), 5.9 (F*c*) and 6.2 P_2/sel). A close similarity existed between friction and diffusion coefficients. The most important differences concerned the phosphoro-phospholipid contents of the enzymes and their free or combined sulfhydryl groups.

79-2113. Badaeva, L. I. (All-Union Res. Inst. Hyg. & Toxicol. Pestic., Polym. & Plast., Kiev, USSR) **Deistvie pestitsidov na aktivnost' kholinesterazy v nervykh elementakh serdtsa beremennykh zhivotnykh i plodov. [Effect of pesticides on cholinesterase activity in the cardiac neural elements of pregnant animals and fetus.]** *Arkh. Anat. Gistol. Embriol.* 76(4): 68-71; 1979. (15 references) (Russian)

To evaluate the effect of pesticides on the activity of cholinesterase (ChE) in pregnant animals, female rats received daily po administration of the organochlorine compound polychlorcamphene (toxaphene) at 0.05 LD50 (12 mg/kg) or the organophosphorus pesticide Valexon (phoxim) at 0.05 LD50 (90 mg/kg). On days 14 and 20 of pregnancy the rats were sacrificed and the ChE activity was determined in the neurons of the cardiac ganglia of the female and the embryo. Exposure to both pesticides results in similar changes in ChE activity. There was an inhibition of ChE activity in the synaptic ring as well as decrease in the activity of trophic (non-synaptic) ChE.

79-2114. Larsson, B.; Tjalve, H. (Dep. Toxicol., Univ. Uppsala, Uppsala, Sweden) **Studies on the mechanism of drug-binding to melanin.** *Biochem. Pharmacol.* 28(7): 1181-1187; 1979. (32 references)

The binding to melanin of chlorpromazine, chloroquine, paraquat and Ni^{2+} has been studied *in vitro* with pigment from beef eyes. The results showed a marked influence of the ionic environment on the ability of the organic substances to bind to melanin, indicating that electrostatic forces between the cationic forms of the substances and anionic sites on the melanin polymer (presumably carboxyl groups) are important for the complex formation. An analysis of the binding by the method of Scatchard showed that more than one binding class must be implicated in the binding of both organic substances and Ni^{2+} to melanin. Several concordances were found for the data of the paraquat and Ni^{2+} binding, indicating a dominant influence of electrostatic forces for the melanin-binding of paraquat. However, several indications were found that non-electrostatic contributions must be added to form the binding-sites for chlorpromazine and chloroquine. It is possible that such contributions may be provided by van der Waals forces occurring at the conjunctions of the aromatic rings in the substances and the aromatic indole-nuclei of the melanin. Experiments with chlorpromazine indicated that the positive ion radical of the substance had a very high melanin-affinity. It is suggested that melanin may be able to oxidize chlorpromazine to a positive ion radical, explaining the firm binding of the substances to melanin and the evidence in the literature favoring this possibility are discussed. (Author abstract by permission)

79-2115. Chipman, J. K.; Walker, C. H. (Dep. Physiol. & Biochem., The University, Reading RG6 2AJ, Berks, England) **The metabolism of dieldrin and two of its analogues: the relationship between rates of microsomal metabolism and rates of excretion of metabolites in the male rat.** *Biochem. Pharmacol.* 28(8): 1337-1345; 1979. (23 references)

Male rats receiving re-entrant bile duct cannulae were given [^{14}C]-dieldrin (HEOD), [^{14}C]- HCE and [^{14}C]-HEOM (15 mg/kg of each) by ip injection. Bile collections were made without anesthesia and nearly all ^{14}C excretion occurred by this route. Maximal ^{14}C rates were observed between 20 and 40 min after dosing and these were much lower for dieldrin (3.17 n*M*/kg body wt/min) than for HCE or HEOM (204 and 298 n*M*/kg body wt/min respectively). Induction of liver enzymes by treatment with sodium phenobarbitone caused a significant increase in ^{14}C excretion in the case of dieldrin (threefold) but not in the case of HCE. The rates of ^{14}C excretion *in vivo* were compared with the rates of metabolism *in vitro* by liver microsomes for each compound. The pattern of primary metabolism observed *in vivo* was similar to that found *in vitro* for both HCE and HEOM. Whereas HCE was metabolized predominantly by microsomal monooxygenase attack, both monooxygenase and epoxide hydratase were important in the degradation of HEOM. The rate of microsomal metabolism of HCE and HEOM by non-induced rat liver microsomes was over 100 times greater than that reported for dieldrin using induced rat liver microsomes. Using values expressed in terms of unit body weight, the maximal rates of microsomal metabolism of HCE and HEOM were 5-6 times greater than the corresponding maximal rates of biliary excretion of their metabolites in non-induced rats. HCE concentrations were measured in liver microsomes from non-induced rats dosed with the chemical. The rates of hydroxylation by liver microosmes at these concentrations were the same order as the corresponding rates of biliary excretion for the hydroxylated metabolites. The rate of microsomal hydroxylation of HCE increased ap-

proximately seventeen-fold in terms of liver weight, after phenobarbitone induction. These results suggest that the rate of metabolism can limit the rate of excretion of dieldrin metabolites in the male rat. With HCE and HEOM, however, the maximum metabolic rate is much faster and does not apparently influence the excretion rate. There may be a "threshold metabolic rate' for these highly liposoluble compounds below which the rate of excretion is limited by the rate of metabolism. (Author abstract by permission)

79-2116. Popov, Ch. S.; Yantchev, I.; Popova, M. P.; Vultcheva, G. M. (Dep. Biochem., Higher Inst. Zootech. & Vet. Med., BU-6000 Stara Zagora, Bulgaria) **Effect of different factors modifying the activity of some enzyme systems of the endoplasmic reticulum on the sensitivity of cell organelles against the damaging action of chemical agents II. Studies with chlorpromazine, 2,4-dinitrophenol, phenobarbital and DDT.** *Br. J. Exp. Pathol.* 60(1): 85-95; 1979. (22 references)

The effect of various stress factors on the stability of intracellular membranes was investigated. Male and female rats were used for the study, and they were subjected to the following influences: burning of the posterior half of the body in water at 70°C for 10 sec; deprivation of the paradoxical phase of sleep for 65 hr; dehydration of the rats by keeping them without water for 4-5 days; low temperature conditioning; or swimming in water until complete exhaustion. The various groups of rats were then treated with certain chemicals to determine if the stress factors caused changes in the action of the chemicals on membranes. Chlorpromazine, 2,4-dinitrophenol, phenobarbital and DDT were the chemicals which were administered to the rats after the stress period. The rats were then sacrificed, and liver homogenates were prepared. The liver homogenates were further separated by centrifuge in order to obtain subcellular fractions. The assessment of lysosome membrane stability was made on the basis of the distribution of acid phosphatase between the homogenate fractions. The distribution of catalase among the homogenate fractions was used as the criterion for peroxisome membrane stability. The stress factors did cause deviations from the usual effects of the chemicals on liver lysosomes and peroxisomes.

79-2117. Manno, M.; Rigoni, F.; Bartolucci, G. B.; Bianchi, M.; Mazzotta, M. (Inst. Ind. Med., Univ. Padova, Padova, Italy) **Effects of tricresyl phosphate on esterase activity of rat serum and tissues.** *Br. J. Ind. Med.* 36(2): 153-156; 1979. (14 references)

Male Wistar albino rats were injected ip with 1% tri-*o*-cresyl phosphate dissolved in olive oil, at a dose rate of 2.8 g/kg/day for 3 days. In another set of experiments male and female rats were injected ip with *n*-hexane or *n*-hexane containing tri-*o*-cresyl phosphate at a level of 2.8 g/kg/day for 3 days. Other animals were exposed to tri-*o*-cresyl phosphate and then to an atmosphere of 500 ppm hexane for 3 days. Increases in liver microsomal arylesterase and NADP oxidase were observed as well as decreases in aliesterase and cholinesterase. Arylesterase and NADP oxidase were not activated in female rats.

79-2118. Ennin, M. A.; Franklin, C. S. (Dep. Pharmacol., Chelsea Coll., Univ. London, London, England) **Some sub-cellular effects of an organophosphorus insecticide, Abate.** *Br. J. Pharmacol.* 68(1): 72P-73P; 1979. (1 reference)

CFHB-remote Wistar rats given Abate (temophos) by ip injection at doses between 10 and 300 mg/kg for 4, 7, or 10 days showed no change in the activity of aspartate transaminase, alanine transaminase, acid phosphatase or ratio of lactate dehydrogenase (2-oxobutarate:pyruvate). Slight reductions in the levels of glutamate dehydrogenase and aminopyrine demethylase at all dose levels, and decreases in the P450 levels in the rats treated for 7 and 10 days were observed. P450 levels increased in rats treated for 4 days at the higher dose levels. Increased doses of Abate caused corresponding decreases in the blood and brain cholinesterase levels.

79-2119. Luty, S.; Latuszynska, J.; Cisak, E.; Przylepa, E. (Dep. Fund. Res., Inst. Ind. Med. & Hgy., PL-20950 Lublin, Poland) **Wplyw parakwatu na narzady wewnetrzne myszy. [Effect of paraquat on the internal organs in mice.]** *Bromatol. Chem. Toksykol.* 11(1): 23-29; 1978. (11 references) (Polish)

BN strain mice were given paraquat in daily doses of 0.01, 0.02, and 0.1 of the LD50 value via stomach tube for 3 mo. Alterations of the microstructure of the lung, kidney, liver and brain were observed in animals that died 4 to 6 wk after the start of the experiment. In mice on the 0.1 LD50 dose regime that survived the 3 mo, hemorrhagic foci and congestion of the lungs, and slight histopathologic changes in the kidney were found. No histological abnormalities were noted in mice given 0.01 and 0.02 of the LD50 level of paraquat.

79-2120. Sastry, K. V.; Sharma, S. K. (Dep. Zool., DAV Coll., Muzaffarnagar, India) **Endrin toxicosis on few enzymes in liver and kidney of *Channa punctatus* (Bloch).** *Bull. Environ. Contam. Toxicol.* 22(1-2): 4-8; 1979. (20 references)

The effect of endrin on a few phosphatases in the liver and kidneys of *Channa punctatus* is described. Living specimens of *Channa punctatus*, were collected from fresh water sources. The fish were allowed to acclimitize to the laboratory aquaria for 3 days. The fish were divided into two groups of 24 individuals. The experimental group was treated with 0.03 mg/l of endrin in tap water for either 15 or 30 days. The control group remained in tap water for the treatment period. After the exposure, the fish were dissected and liver and kidneys were collected. Homogenates were prepared in 0.25 sucrose solution, and after centrifugation, the supernatant fluids were used as the source of enzymes. Acid phosphatase, alkaline phosphatase, and glucose-6-phosphatase were the enzymes whose activities were measured. Exposure of fishes for 15 days to endrin resulted in the inhibtion of activites of acid phoshatase and glucose-6-phosphatase in the liver. The activities of these enzymes were elevated above normal levels in fish treated for 30 days. The activites of the three enzymes in the kidney were elevated for both exposure periods.

79-2121. Sharma, S. K.; Sastry, K. V. (Dep. Zool., DAV Coll., Muzaffarnagar, India) **Alteration in enzyme activities in liver and kidney of *Channa punctatus* exposed to endrin.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 17-20; 1979. (15 references)

The alteration in the activities of a few enzymes in the liver and kidney of *Channa punctatus* exposed to endrin is described. Live fish were collected from fresh water sources and were maintained in the laboratory aquaria. The fishes were treated with a sublethal concentration (0.01 mg/l) of endrin for 30 days in tap water. Controls were maintained in endrin-free tap water. After the 30-day period, both groups of fish were dissected and liver and kidney were collected. Ten percent homogenates were prepared in 0.25 *M* sucrose solution, and after centrifugation, the clear supernatant fluids were used as the source of enzymes. Alkaline phosphatase, acid phosphatase, glucose-6-phosphatase, amylase, and lipase were the enzymes whose activities were measured. The activities of all three phosphatases and the lipase in the liver was inhibited by treatment of fish with endrin. The three phosphatases showed a slight elevation in activity in the kidney.

79-2122. Khanna, R. N.; Misra, D.; Anand, M.; Sharma, H. K. (Ind. Toxicol. Res. Cent., Lucknow 226001, India) **Distribution of endosulfan in cat brain.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 72-79; 1979. (11 references)

The distribution of endosulfan in different areas of the brain after iv administration of a single dose of endosulfan was investigated. A total of 28 cats were separated into seven groups of four cats each and were anesthetized with ip injection of sodium pentobarbital. The tracheas were cannulated and the animals were ventilated with a respiratory pump. One group served as controls. The cats of the other groups were injected with a single dose of 3 mg/kg of endosulfan, and were sacrificed at an interval of 15 min, 30 min, and 1, 2, 4, and 6 hr by injecting air directly into the heart. At the end of each interval, blood was drawn from the femoral vein and plasma was separated. Liver, spinal cord, cerebral cortex, cerebellum and brain stem were also removed. All the plasma and tissue samples were immediately frozen for subsequent analysis by gas chromatography for endosulfan concentration. Endosulfan was found to distribute differentially in the CNS, and the concentration pattern changed with time. White matter had a slower uptake and release with a lower maximum concentration of endosulfan than did gray matter.

79-2123. Walker, E. M.; Gale, G. R.; Atkins, L. M.; Gadsden, R. H. (Dep. Lab. Med., Med. Univ. South Carolina, Charleston, SC 29403) **Some effects of atrazine on Ehrlich ascites tumor cells *in vitro* and *in vivo*.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 95-102; 1979. (16 references)

The effects of atrazine on Ehrlich ascites tumor cells were investigated. Ehrlich ascites cells were maintained in BALB/c mice. DMSO solution was used as the solvent for the atrazine. The volume of DMSO solution injected was 0.1 mg/40 g body weight for each control or treated mouse. The following parameters were investigated: rates of synthesis of DNA, RNA and protein and *de novo* synthesis of RNA purines. ^{3}H-Thymidine-methyl, ^{3}H-uridine-5, ^{14}C-L-leucine, and ^{14}C-sodium formate were used to determine the desired parameters. The effects of atrazine on DNA, RNA and protein synthesis was also determined *in vitro*. The final concentrations of DMSO were 1% (v/v) for the *in vitro* studies. Atrazine was found to have an inhibotory effect on purine biosynthesis *in vivo*. Both the *in vivo* and *in vitro* studies showed that atrazine has an inhibitory effect on DNA, RNA and protein synthesis.

79-2124. Scorgie, H. R. A.; Cooke, A. S. (Nat. Environ. Res. Counc., Inst. Terr. Ecol. Monks Wood Exp. Stn., Huntingdon, England) **Effects of the triazine herbicide cyanatryn on aquatic animals.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 135-142; 1979. (12 references)

Laboratory experiments were performed to establish whether cyanatryn exerts direct toxic effects on the frog, *Rana temporaria*, the snail, *Lymnaea peregra*, or *Daphnia pulex*. The tests using *Daphnia* were done by treating groups of ten adults in glass vials using concentrations of 0.2, 2 and 20 ppm of cyanatryn for a 3-day period. Adult snails were treated in groups of 5 in the same concentrations of cyanatryn for a 2-day period. Snail egg masses were also exposed to cyanatryn, and observations on the embryonic development and survival of juvenile snails were recorded for a 20-day period. *Rana* tadpoles were treated in groups of ten in 250 ml of test medium. Solutions of 0.2, 2, and 20 ppm of pure cyanatryn were used for a 24-hr test period. The concentrations of cyanatryn had an adverse effect on all of the aquatic animals tested. After 15 min at 20 ppm, several individuals in the *Daphnia pulex* populations showed uncoordinated swimming movements and sank to the bottom. Three days later they were all dead. In the snail tests, 60% of the animals in the 20 ppm treatment group were dead after 2 days. Eggs of *Lymnaea peregra* exposed to 20 ppm of cyanatryn showed a high incidence of embryonic deformities and all failed to hatch. The tadpoles exposed to 20 ppm cyanatryn were lethargic, and displayed spasmodic twitching and shuddering.

79-2125. Judd, F. W. (Dep. Biol., Pan American Univ., Edinburg, TX 78539) **Acute toxicity and effects of sublethal dietary exposure of monosodium methanearsonate herbicide to *Peromyscus leucopus* (Rodentia: Cricetidae).** *Bull. Environ. Contam. Toxicol.* 22(1-2): 143-150; 1979. (11 references)

A study was done to determine the acute toxicity of monosodium methanearsonate (MSMA) herbicide to the rodent *Peromyscus leucopus*, and to assess the sublethal effects of MSMA on hematocrit, hemoglobin concentration and blood glucose concentration. The field animals used in the experiment were trapped in Hidalgo County, Texas or they were F1 offspring of field animals. The mice were divided into 5 groups. The first group received 10,000 ppm of MSMA in their drinking water. The second, third, and fourth groups received 5,000, 3,000, and 1,000 ppm respectively, of the herbicide by the same route. The fifth group received tapwater, and served as controls. The acute toxicity of single oral doses

delivered by intubation was also determined. Single oral doses greater than 500 mg MSMA/kg were 100% lethal while doses of 150 mg or less produced no mortality. The 3,000, 5,000 and 10,000 ppm solutions of herbicide were found to be over 90% lethal to mice when administered for a 21-day period. All the controls and the mice on the 1,000 ppm regimen survived. The effects of the 1,000 ppm regime on hematocrit, hemoglobin concentration and blood glucose concentration was determined. Mice which received the herbicide in their drinking water for 30 days showed a significant decrease in mean hematocrit and blood glucose concentration.

79-2126. Dumont, J. N.; Schultz, W.; Jones, R. D. (Biol. Div., Oak Ridge Natl. Lab., Oak Ridge, TN 37830) **Toxicity and teratogenicity of aromatic amines to *Xenopus laevis*.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 159-166; 1979. (16 references)

The toxicity and teratogenicity of several aromatic amines known to be present in coal conversion process waters on the early embryonic stages of *Xenopus laevis* was examined. Embryos of *Xenopus laevis*, the South African clawed frog, were obtained from paired adults injected with human chorionic gonadotropin. Replicates of 25 embryos each were tested by exposing early cleavage to mid-blastula embryos at 20°C in bowls containing 250 ml of test solution. Aniline, pyridine, quinoline, 2-methylquinoline and 2,6-dimethylquinoline were the aromatic amines which were tested. Embryos reared in water without aromatic amines served as controls. The number of deaths and abnormal embryos was recorded. Quinoline was found to be more toxic and teratogenic than either aniline or pyridine. The most toxic compound studied was 2,6-dimethylquinoline which caused high rates of mortality and abnormal development in concentrations as low as 5 mg/l.

79-2127. Rozman, K.; Williams, J.; Mueller, W. F.; Coulston, F.; Korte, F. (Ges. Strahlen. & Umwelforsch., Munich, BRD) **Metabolism and pharmacokinetics of pentachlorobenzene in the rhesus monkey.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 190-195; 1979. (4 references)

Single oral doses of 0.5 mg/kg of ^{14}C-pentachloro-benzene (PCBz a breakdown product of hexachlorobenzene) was given to male and female rhesus monkeys. The chemical was readily absorbed and evidence indicates the lymphatic system was involved in the absorption process. The major excretory pathway was via the feces. It is suggested that the metabolic system for PCBz involved some mechanism other than the hepatic cytochrome P450. It is suggested that two different hydroxylation pathways could be involved. The first calls for oxidation of the PCBz to PCPh, and the second calls for nucleophilic displacement reactions of PCBz to TCPH-s in sites which are metabolically active, other than the liver.

79-2128. Raizada, R. B.; Datta, K. K.; Dikshith, T. S. S. (Ind. Toxicol. Res. Cent., Mahatma Gandhi Marg., Lucknow 226001, India) **Effect of zineb on male rats.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 208-213; 1979. (23 references)

Male albino rats were orally administered zineb at a dose of 1000 mg/kg/day for 30 days. Experimental and control animals were sacrificed on day 30. Thyroid, pituitary and testes were removed, weighed, and examined histologically. No clinical symptoms of fungicide poisoning were observed during the test period. The experimental group showed a significant increase in the weights of the thyroid and pituitaries. No significant change in the weight of the testes occurred. Thyroids from the treatment group had an increase in follicular cell height and area, and diminished stain of colloid. Testes exhibited damaged seminiferous tubules showing necrosis and giant cells within their lumens.

79-2129. Morgan, D. P.; Sandifier, S. H.; Hetzler, H. L.; Slach, E. F.; Brady, C. D.; Colcolough, J. (Iowa Epidemiol. Stud. Program Pestic., Dep. Prev. Med. & Environ Health, Univ. Iowa Coll. Med., Iowa City, IA 52242) **Test for *in vivo* conversion of mirex to Kepone.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 238-244; 1979. (16 references)

Studies were performed to determine whether or not mirex undergoes an *in vivo* transformation to Kepone (chlordecone). Pitman-Moore minipigs were fed 50 mg mirex/day for 7 days. Blood, urine, and back fat were collected before and after the tests. Nine days after the final dose, the aninals were sacrificed and necropsied. All samples were analyzed for mirex and Kepone. Plasma and RBC mirex values averaged 0.34 and 0.12 ppm, respectively, at the end of dosing. Nine days after dosing, values for plasma and RBC mirex were 0.04 and 0.01, respectively. Back fat concentrations averaged 39.8 ppm mirex at the end of dosing, and 41.5 ppm 9 days after dosing. Nine days after dosing, mirex values for liver averaged 1.24 ppm, for kidney 0.44 ppm, and for brain 0.62 ppm. No Kepone was observed in any of the tissues examined.

79-2130. Jordan, L. W.; Neal, R. A. (Cent. Environ. Toxicol., Dep. Biochem., Vanderbilt Univ. Sch. Med., Nashville, TN) **Examination of the *in vivo* metabolism of maneb and zineb to ethylenethiourea (ETU) in mice.** *Bull. Environ. Contam. Toxicol.* 22(1-2): 271-277; 1979. (24 references)

Adult male ND/4(S)BR mice were fed *ad libitum* radioactively labeled maneb, zineb, ethylenethiourea (ETU) or ethylenebis diisothiocyanato sulfide (EBIS). Urine, feces, and CO_2 were collected and analyzed. Recovery rate of each compound was proportional to the dose. Total recovery from EBIS and zineb was less than with ETU and maneb. Less maneb and zineb was excreted than ETU and EBIS. None of the ^{14}C-ETU, EBIS, maneb or zineb was excreted as ^{14}C-CO_2. The percent recovery of radioactivity ranged from 53.5% for EBIS which was administered at 0.05 m*M*/kg to 100.6% for ETU which was dosed at 0.25 m*M*/kg. Twelve percent of the radioactivity in the urine following ^{14}C-ETU dosing was present as ethylenurea with the remainder being unidentifiable polar products. Sixteen percent of the maneb was recovered as ETU. One percent of the zineb was recovered as ETU.

79-2131. Chekman, I. S.; Natsyuk, M. V. (Dep. Pharmacol., Kiev Med. Inst., Kiev, USSR) **Effect of dipyroxime on content of nicotinamide coenzymes and adenine nucleotides in the myocardium and liver of rats poisoned with phthalaphos.** *Bull. Exp. Biol. Med. USSR* 84(11): 1600-1602; 1978. (13 references)

Male albino rats were given phthalaphos at a dose level of 70 mg/kg in the form of a 2% emulsion in sunflower oil, administered via gastric tube in a single dose. The first day after injection saw a clinical picture of acute poisoning develop. Blood cholinesterase was lowered by 68.6%. Nicotinamide coenzyme concentration in the tissues was changed. Oxidized forms in the myocardium decreased 24.6%. Dipyroxime was injected into the thigh muscle of some of the rats at 10 to 15 min after poisoning. Dipyroxime was used at a concentration of 10 mg/kg. All rats so treated survived, and there was little alteration of the nicotinamide coenzymes in the organs of these animals.

79-2132. Komissarenko, V. P.; Chelnakova, I. S.; Mikosha, A. S. (Lab. Pathophysiol., Inst. Endocrinol. & Metab., Kiev, USSR) **Effect of *o,o*-dichlorodiphenyl dichloroethane and perthane *in vitro* on glutathione reductase activity in the adrenals of dogs and guinea pigs.** *Bull. Exp. Biol. Med. USSR* 85(2): 162-154; 1978. (7 references)

Cytoplasmic fractions and homogenates of dog and guinea pig adrenocortical tissues were incubated with 156 - 312 μM concentrations of *o,p'*-DDT or Perthane (ethylan). Glutathione reductase activities were determined spectrophotometrically. The addition of 312 μM *o,p'*-DDT and Perthane to dog homogenates increased GSH reductase activity by 66 and 22%, respectively, while in the cytoplasmic fractions, enzyme activity increased by 90 and 34%, respectively. At 156 μM the pesticides caused no changes in the dog tissues, but did elevate GSH reductase of guinea pig adrenals.

79-2133. Obersteiner, E. J.; Sherma, R. P. (Toxicol. Program, Utah State Univ., Logan UT 84322) **Evaluation of cytotoxic responses caused by selected organophosphorus esters in chick sympathetic ganglia cultures.** *Can. J. Comp. Med.* 42: 80-88; 1978. (22 references)

Morphological alterations and growth inhibition at the cellular and subcellular level by organophosphorus compounds were investigated. Sympathetic dorsal root ganglia from 10-11 day-old chick embryos were exposed to varying concentrations (10 mM to 0.1 μM) of pesticides. Following a 3-day incubation period, nerve fibers, neurons, and glial cells were observed for growth and differentiation. All organophosphate- treated cells, exhibited dose-related toxic responses. Methyl parathion, diazinon, paraoxon, mevinphos, DFP, and TOTP were severely cytotoxic (with concentrations to produce half maximal effect to 1.0 μM), while leptophos, coumaphos, mono- and dicrotophos produced intermediate cytotoxicities (1.0 mM concentrations). Slight or no toxic effects were observed for EPN, TMTP, chlorpyrifos, and TPP ($\leq$ to 10 mM). In all cases nerve fibers were more sensitive than glial cells or neurons.

79-2134. Hsia, M. T. S.; Kreamer, B. L. (Dep. Entomol. & Cent. Environ. Toxicol., Univ. Wisconsin, Madison, WI 53706) **Induction of unscheduled DNA synthesis in suspensions of rat hepatocytes by an environmental toxicant, 3,3',4,4'-tetrachloroazobenzene.** *Cancer Lett.* 6(4): 207-212; 1979. (12 references)

In order to study unschueduled DNA synthesis, hepatocytes were isolated from 2 mo old male Sprague-Dawley rats and suspended in culture medium to which 3,3',4,4'-tetrachloroazobenzene (TCAB, a byproduct of 3,4-dichloroaniline synthesis) had been added. DNA was isolated by chloroform-isoamyl-phenyl extraction of nuclei. Synthesis rates were estimated by ^{3}H-thymidine incorporation. Comparisons between treatment and control groups were made. Unscheduled DNA synthesis was induced by TCAB in a definite dose-dependent manner. It is suggested that this technique has potential as a rapid carcinogen-screening method.

79-2135. Caulfield, M. J.; Burleson, G. R.; Pollard, M. (Lobund Lab., Dep. Microbiol., Univ. Notre Dame, Notre Dame, IN 46556) **Ozonation of mutagenic and carcinogenic alkylating agents, pesticides, aflatoxin B_1, and benzidine in water.** *Cancer Res.* 39(6, pt. 1): 2155-2159; 1979. (26 references)

The effects of ozonation on the mutagenicity of carcinogens and mutagens in water were investigated. *Salmonelle typhimurium* histidine auxotroph strains TA 1535, TA 1537, TA 98, and TA 100 were used in kinetic studies of the chemicals. Liver homogenates of male Lobund Sprague-Dawley rats were used, and the mutagenesis assay was a modification of the method of Ames. The pesticides captan and Dexon (fenaminosulf), diluted to a concentration of 20 μg/ml, were completely inactivated by ozone in 30 sec. One μg aflatoxin B_1/ml water was completely inactivated by ozonation in 30 sec, while oxygenation had no effect on its mutagenicity. The mutagenicities of BCA and sodium azine were destroyed by ozonation, while no changes were observed for MNNG and MAM. DMH and HEH (100 μg/), when ozonated, formed intermediates which were highly mutagenic.

79-2136. Albro, P. W.; Corbett, J. T.; Harris, M.; Lawson, L. D. (Environ. Biol. & Chem. Branch, NIEHS, Research triangle Park, NC 27709) **Effects of 2,3,7,8-tetrachlorodibenzo-p-dioxin on lipid profiles in tissue of the Fishcher rat.** *Chem. Biol. Interact.* 23(3): 315-330; 1978. (33 references)

Female Fischer rats were given single oral doses of 10, 50, or 100 μg 2,3,7,8- tetrachloro dibenzo-*p*- dioxin (TCCD)/kg. Animals were killed 1, 3, 13, or 21 days after exposure. Tissues were examined by light and electron microscopy. Livers in rats receiving sublethal doses contained increased triglyceride and free fatty acid levels with decreased sterol levels. Lethal doses resulted in cholesterol and fatty acid increases in the liver, but no change in triglycerides. Serum lipoprotein composition was altered, as was the ultrastructure of the liver. Radical-induced lipid peroxidation as a mechanism of toxicity appears to be related to the elevation of organic-soluble fluorescent pigment in the heart.

79-2137. Boylan, J. J.; Cohn, W. J.; Egle, J. L., Jr.; Blanke, R. V.; Guzelian, P. S.* (Med. Coll. Virginia, Richmond, VA 23298) **Excretion of chlordecone by the gastrointestinal tract: evidence for a nonbillary mechanism.** *Clin. Pharmacol. Ther.* 25(5): 579-585; 1979. (11 references)

A 46-yr-old white male had been exposed to chlordecone for a period of 6 mo while employed in Hopewell, Va. Equal amounts of chlordecone and its reduced metabolite, chlordecone alcohol, were being excreted in the bile at a rate four times faster than in the stool. Due to clinical evidence of gallstones, a cholecystectomy was performed. Fecal excretion of chlordeconc alcohol was abolished when the biliary contents were diverted through a T tube. It is suggested that disappearance of chlordecone alcohol from the feces was due to interuption of its passage via bile to the intestine. Chlordecone continued to appear in the stool, and the amount contained therein was 6 to 10 times greater than when diverted bile was continuously infused into the duodenum. Similar studies were performed in rats and it was concluded that chlodecone enters the intestinal lumen from a nonbiliary source, probably the gut, and that net excretin of chlordecone from this source can be augmented by cholestyramine.

79-2138. Cantelmo, A. C.; Rao, K. R. (Fac. Biol., Univ. West Florida, Pensacola, FL 32504) **The effects of pentachlorophenol (PCP) and 2,4-dinitrophenol (DNP) on the oxygen consumption of tissues from the blue crab, *Callinectes sapidus*, under different osmotic conditions.** *Comp. Biochem. Physiol. C.* 60(2): 215-219; 1979. (36 references)

Mature male and female blue crabs were exposed to concentrations of 0.005*M* PCP and DNP (2,4,-dinitrophenol). Oxygen consumption was inhibited by this exposure in the tissues examined. Exposure to lower concentrations of 1 or 50 μM did not alter the *in vitro* oxygen consumption of excised gills, hepatopancreas or muscle from blue crabs. The osmotic condition of the animal and the tissue itself did not alter the inhibitory effect of PCP on the consumpton of oxygen.

79-2139. Wright, A. S.; Donninger, C.; Greenland, R. D.; Stemmer, K. L.; Zavon, M. R. (Sittingbourne Res. Cent., Shell Toxicol. Lab., Shell Res. Ltd., Sittingbourne, Kent ME9 8AG, England) **The effects of prolonged ingestion of dieldrin on the livers of male rhesus monkeys.** *Ecotoxicol. Environ. Saf.* 1(4): 477-502; 1978. (58 references)

Six groups of five 4-yr-old, male rhesus monkeys were fed dieldrin at dietary concentrations ranging from 0.01 to 5 ppm (0.01, 0.1, 0.5, 1.0, 1.75, and 5.0 ppm) for 6 yr. Due to the death of one of the animals at 4 mo, the 5 ppm regimen was reduced to 2.5 ppm. Living animals were sacrificed in pairs by CO_2 asphyxiation followed by decapitation on a 6 mo schedule beginning with treatment mo 69. Blood was collected for dieldin analysis. The livers were removed, sampled for sectioning, and weighed. Bile was removed from excised gall bladders. There was no alteration of microscopic structure, weight, DNA or RNA content of livers of experimental animals. A significant increase in liver protein occurred at the 1.75 treatment level. Induction of the microsomal monooxygenase system was observed at a dietary intake of 25-30 μg/kg body wt/day. This corresponded with a liver concentration of 6-7 ppm. It was concluded that there is a low liver sensitivity and a slow metabolic clearance rate of dieldrin in primate species.

79-2140. Nohynek, G. J.; Mueller, W. F.*; Coulston, F.; Korte, F. (P.O. Box 1027, Holloman AFB, NM 88330) **Metabolism, excretion and tissue distribution of [^{14}C]photodieldrin in nonhuman primates following oral administration and intravenous injection.** *Ecotoxicol. Environ. Saf.* 3(1): 1-9; 1979. (15 references)

Rhesus monkeys received single doses of 4.5 mg ^{14}C-photodieldrin iv or 2 mg ^{14}C-photodieldrin po. Urine and feces were collected every 24 hr. Twenty-one days post-injection, 45 and 34% of the dose was excreted by males and females, respectively. Approximately 66% of the excreted radioactivity was found in the urine. The injected animals were sacrificed after 21 days, and the organs and tissues were analyzed. Adipose tissue, liver, bile bone marrow, mesenteric lymph nodes, and adrenal cortex all had high concentrations of photodieldrin and/or its metabolites. *Trans*-photoaldrinol was identified as the major metabolite in urine and feces.

79-2141. Conradt, P.; Mueller, W. F.*; Loose, L.; Klein, W.; Coulston, F.; Korte, F. (P.O. Box 1027, Holloman AFB, NM 88330) **Incorporation of [^{3}H]uridine into RNA under the influence of dieldrin and polychlorinated biphenyls.** *Ecotoxicol. Environ. Saf.* 3(1): 10-17; 1979. (9 references)

Mouse peritoneal macrophages were incubated with the PCB Aroclor 1242 or with dieldrin. RNA synthesis, measured as [^{3}H]uridine incorporation, was determined. Synthesis was depressed by dieldrin in a dose and time related manner beginning at the 1 ppm level. Depression by the PCB followed in a similar manner at concentrations of 7 ppm or greater. In studies on the effects of the chemicals on active phagocytizing cells, morphological changes were not observed, but RNA synthesis was further depressed. It is suggested that organochlorine induced immunosuppression works at the level of RNA synthesis.

79-2142. Walker, C. H.; Chipman, J. K.; Kurukgy, M. (Dep. Physiol. & Biochem., Univ. Reading, Witeknights, Reading, Berks RG6 2AJ, England) **Microsomal systems as models for *in vivo* metabolism.** *Ecotoxicol. Environ. Saf.* 3(2): 39-46; 1979. (11 references)

Studies were performed on liver microsomes of rats, rabbits, Japanese quail, and pigeons to determine *in vitro* metabolism of several dieldrin analogs. 1,2,3,4,9,9- Hexachloro-*exo*-5,6- epoxy, 1,4,4a,5,6,7,8,8a- octahydro- 1,4-methano naphthalene (HCE) was degraded by microsomal monooxygenase. 1,2,3,4,9,9,- Hexachloro- 6,7-epoxy 1,4,4a,5,6,7,8,8a-octahydro- 1,4-methano naphthalene (HEOM) was attacked by monooxygenase and epoxide hydratase equally. *In vivo* tests on the same species were performed by injection of HCE, HEOM,

and dieldrin into the peritoneal cavity. Metabolite quantities in both the urine and feces were measured. The same sequence of primary and secondary oxidants were formed as in the *in vitro* studies. Both HCE and HEOM were metabolized more rapidly *in vitro* than *in vivo*. The rate of excretion of HCE and HEOM is dependent upon the rate they are available to the liver. Dieldrin metabolism, however, is very slow, and limits the rate of its metabolite excretion.

79-2143. Petrushenko, V. V. (Author address not given) **Giperpoliarizatsiya membrannogo potentsiala rastitel'noi kletki pri deistvii razlichnykh faktorov sredy. [Hyperpolarization of membrane potential of plant cells under the influence of various environmental factors.]** *Elektron. Obrab. Mater.* (5): 78; 1978. (Russian)

The effect of various environmental factors on the membrane potential (MP) of the plant cell (*Nitella flexilis*) was studied. It was found that such factors as light, and herbicides, 2,4-D at 0.1 to 10 m*M* and isopropyl-*N*-phenylcarbamate at 100 m*M*, as the well as synthetic growth regulator maleic hydrazide at 100 m*M* or 10 m*M* cause hyperpolarization of MP. It is suggested that one of the possible causes of hyperpolarization is changes in the permeability of membranes for certain ions.

79-2144. Chernoff, N.; Linder, R. E.; Scotti, T. M.; Rogers, E. H.; Carver, B. D.; Kavlock, R. J. (Exp. Biol. Div., Health Effects Res. Lab., US EPA Research Triangle Park, NC 27711) **Fetotoxicity and cataractogenicity of mirex in rats and mice with notes on Kepone.** *Environ. Res.* 18(2): 257-269; 1979. (11 references)

In fetotoxicity studies, mirex was administered to pregnant rats by gastric gavage at 5 to 38 mg/kg/day on days 7-16 gestation. Animals were sacrificed on day 21. Edema resulted in the fetuses at a rate of 5.8% for the 5 mg/kg/day group to 74% for the 19 mg/kg/day group. A significant number of fetuses demonstrated a dose-related decrease in average percentage of dead fetuses. Cataractogenicity studies were performed by administering mirex and Kepone (chlordecone) to rat and mouse dams and neonates by gavage. Dose related incidences of irreversible cataracts resulted from mirex administration, but not from Kepone. Ten mg mirex/kg was cataractogenic in both albino and non-albino rats. Twelve mg mirex/kg was cataractogenic in mice. Cataracts appeared by day 13 in rats and after day 20 in mice.

79-2145. Gellert, R. J.; Wilson, C. (Dep. Obst. & Gynecol. RH-20, Univ. Washington, Seattle, WA 98195) **Reproductive function in rats exposed prenatally to pesticides and polychlorinated biphenyls (PCB).** *Environ. Res.* 18(2): 437-443; 1979. (29 references)

Female Sprague-Dawley rats were fed methoxychlor, Kepone (chlordecone), dieldrin, aldrin, Aroclor 1221, Aroclor 1242, and Aroclor 1260 while pregnant. Of the twenty-one offspring exposed to Kepone, 12 developed persistent vaginal estrus. At autopsy the ovaries of all 21 were devoid of corpora lutea and were significantly smaller in weight. Four animals exposed to Aroclor 1221 and methoxychlor became anovulatory, which was not significantly different from controls. Fertility in the male offspring was not affected by Kepone and other xenobiotics. Testicular weight was increased in the Aroclor 1260 exposed rats. Dieldrin caused a significant increase in adrenal weights in male offspring.

79-2146. Rath, S.; Misra, B. N. (Lab. Environ. Toxicol., Dep. Bot., Berhampur Univ., Berhamputpur 760007, Orissa, India) **Sub-lethal effects of dichlorvos (DDVP) on respiratory metabolism of *Tilapia mossambica*, Peters of 3 age groups.** *Exp. Gerontol.* 14(1): 37-41; 1979. (12 references)

Tilapia fish were exposed under various conditions to dichlorvos at 1.0 mg/l concentration. In one experiment the fish were exposed for a 21 day period. In a second experiment exposure was over a 5 day period with one group of fish experiencing changes in the medium every 24 hr. Oxygen consumption and ventilation rates were measured daily. A positive correlation was noted between ventilation rates and oxygen consumption in all age groups exposed. An inverse relationship was noted between body weights and respiratory rates in both pre-exposure and post-exposure studies. Insecticide concentration and oxygen consumption rates showed a negative correlation in all age groups. A direct relation was noted between toxicity and active metabolism, and an inverse relation between toxicity and age. Respiratory rates did not return to pre-exposure conditions on transferring the exposed fish to freshwater. This indicates irreversible damage to the respiratory system.

79-2147. Feare, C. J.; Summers, D. D. B.; Longstaff, R. (Pest Infest. Control Lab., Worplesdon, England) **Toxicity of endrin-treated pear buds to bullfinches.** *Exp. Hortic.* 30: 42-45; 1978. (5 references)

The toxicity of endrin-treated pear-buds to bullfinches (*Pyrrhula pyrrhula* L.) was tested in a number of feeding experiments. Bullfinches were kept in cages in pairs and fed pear buds treated with 0.15% endrin for 24 hr. Control birds were fed untreated buds, and other birds were given 0.8% xylene-treated buds. The number of buds consumed was recorded, and surviving birds were later tested for aversion to eating treated buds. Both control and experimental birds were sacrificed and analyzed later for tissue levels of endrin by GLC. Analysis of the results showed a high mortality level for birds ingesting endrin-treated pear buds. The repellent factor calculated for endrin-treated buds was only 0.15%. No aversion to bud feeding was noted in birds who had previously eaten endrin-treated buds, suggesting that the reduction in bud consumption observed in endrin sprayed fields was mainly due to a decrease in bullfinch populations from high bird mortality. Endrin was found in the hepatic tissues of birds fed treated buds. The repellency properties of xylene warrant further investigation due to the seemingly greater repellence of birds from buds treated with the xylene

carrier alone than from buds treated with endrin-xylene emulsions.

79-2148. Hasan, M.; Maitra, S. C.; Ali, S. F. (Brain Res. Lab., Dep. Anat., Jawaharial Nehru Med. Coll., Aligarh Muslim Univ., Aligarh, India) **Organophosphate pesticide DDVP-induced alterations in the rat cerebellum and spinal cord - an electron microscopic study.** *Exp. Pathol.* 17(2): 88-94; 1979. (12 references)

Male albino rats were exposed to dichlorvos at a concentration of 3 mg/kg administered ip daily for 10 days. Toxicity symptoms were readily noted which included hyperexcitability to tactile stimuli and occasionally fasiculation, convulsions and ataxia. Autopsies performed on two animals indicated congestion of meninges and signs of minimal cerebral edema. No significant difference in brain weight was noted between animals exposed to DDVP and controls. As many as 38 mitochondria in one field were noted in a few neurons of the spinal cord. An abnormal increase in the number of mitochondrial profiles was observed. Myelin degeneration was detected in the spinal cord and myelin figures were occasionally noted within edematous dentritic profiles.

79-2149. Leonov, V. I. (Dep. Pharmacol., S. V. Kurashov Med. Inst., Kazan, USSR) **Toksiko-farmakologicheskaia kharakteristika nekotorykh gomologov armina i nibufina. [Toxic-pharmacological characteristics of some homologs of armine and nibufin.]** *Farmakol. Toksikol. (Moscow)* 42(3): 299-302; 1979. (5 references) (Russian)

The results of toxic pharmacological evaluation of armine and nibufin homologs, butyl *p*-nitrophenyl ester of ethylphosphonic acid (preparation 94), ethyl *p*-nitrophenyl ester of butylphosphonic acid (preparation 1326), butyl *p*-nitrophenyl ester of butylphosphonic acid (preparation 1445) and *p*-nitrophenyl ester of diethylphosphinic acid (preparation 131) are presented. The acute and chronic toxicity of compounds was studied in albino mice. All compounds caused cholinergetic excitation. The LD50 after sc administration for compounds 94, 1326 and 131 was 1.5, 1.2 and 3.4 mg/kg, respectively, compared with 0.33 mg/kg for armine and 7.2 mg/kg for nibufin. The LD50 after iv administration for compounds 94, 1326, 1445 and 131 was 1.3, 1.0, 4.9 and 3.35 mg/kg, respectively, compared with 0.25 mg/kg for armine and 4.8 mg/kg for nibufin. The maximum permissible concentrations after 30-day iv administration were 0.75, 0.75, 4.0 and 2.5 mg/kg, respectively, compared with 0.13 mg/kg for armine and 2.5 mg/kg for nibufin. All compounds were found to inhibit cholinesterase activity *in vitro*.

79-2150. Khomenko, N. R. (All-Union Res. Inst. Hyg. & Toxicol. Pestic., Polym. & Plastics, Kiev, USSR) **K voprosu o neirotoksicheskom deistvii dilora. [On the neurotoxicity of dilor].** *Fiziol. Zh. (Kiev)* 25(2): 210-212; 1979. (2 references) (Russian)

The effect of organochlorine pesticide dilor on the functional state of neuromuscular, peripheral and central nervous systems was studied in cats and random-bred albino rats. Chronic daily po administration of Dilor (at 100 mg/kg for 3 mo and at 20 mg/kg for 6 mo) resulted in marked (by 25.75% and 32.34%, respectively) decrease in rate of stimulation conductance in rats. Cats exposed to inhalation of dilor (0.9 mg/m^3 for 4 mo) showed marked disorders in conditional reflex activity.

79-2151. Sanga, M.; Tanizaki, T. (Tokushima Citizens Hosp., Tokushima, Japan) **[Alteration of electroretinogram of rabbits due to long-term administration of an organophosphorus pesticide.]** *Ganka Rinsho Iho (Jpn. Rev. Clin. Ophthalmol.)* 73(5): 560; 1979. (Japanese)

In order to examine the elongation of the latent time period of the a-wave on electroretinogram which is said to appear in patients suffering from chronic intoxication of organophosphorus pesticides, fenitrothion was orally administered at 1 or 10 mg/kg/day to two groups of albino rabbits. Electroretinograms were performed and analyzed. An elongation of the latent time period for appearance of the peak wave of a_1 was observed. Reduction of the latent time period for appearance of rythmical wavelet 0_3 was observed, however the latent time period for appearance of rythmical wavelets 0_1 and 0_2 did not change. The alterations of the latent time periods for appearance of waves a_1 and 0_1 would be useful in clinical diagnosis of intoxication due to organophosphorus pesticides.

79-2152. Olefir, A. I. (Inst. Vocat. Hyg. & Occup. Dis., Kiev, USSR) **O pokazatel'nosti nagruzochnykh prob pri vyiavlenii deistviya faktorov maloi intensivnosti. [Significance of loading tests for evaluating the effects of low intesity factors.]** *Gig. Sanit.* 44(4): 44-46; 1979. (4 references) (Russian)

The significance of various loading tests for evaluating the adaptability of organisms to low intensity factors was studied in rats exposed to organophosphorus pesticide Carbophos (malathion) or to a derivative of dithiocarbamic acid TMTD (thiram) at 0.01 LD50. After 4.5 mo exposure, animals were subjected to a specific loading test (single administration of Carbophos at 0.25 LD50 or TMTD at 0.1 LD50) or to a nonspecific loading test (administration of pyrogen, exposure to cold, or creation of abscess). Before the test and on days 1-15 after the test the levels of lysozyme, β-lysin and complement, bactericidic activity of serum and skin, and phagocytic activity of free and fixed macrophages were assessed. It was found that specific tests resulted in more frequent manifestations of adaptation reactions. The humoral and cellular indices of natural resistance were more stable under the effects of external factors.

79-2153. Razvaga, R. I.; Kiseleva, N. I. (All-Union Res. Inst. Hyg. & Toxicol. Pestic., Polym. & Plastics, Kiev, USSR) **K voprosu detoksikatsii polikhlorirovannykh terpenov. [Detoxication of polychlorinated terpenes].** *Gig. Sanit.* 44(4): 51-53; 1979. (6 references) (Russian)

The process of transformation of polychlorinated terpenes into less toxic derivatives was studied. Incubation of polychloropinene (PCP) and polychlorocamphene (PCC) with potassium 2-methoxyethylate resulted in rapid detoxication (for 30-60 min) of both pesticides. The products of detoxication were identified by UV-spectroscopy and gas-liquid chromatography. It was found that detoxication of polychloroterpenes is associated with their dechlorination. The LD50 of the products of detoxication of PCP and PCC (po administration to albino rats) was 2,350 and 2,100 mg/kg, respectively, compared with 165 and 55 mg/kg for PCP and PCC.

79-2154. Aleksashina, Z. A.; Buslovich, S. Iu.; Kolosovskaia, V. M. (Byeloruss. Res. Sanit. Inst., Minsk, USSR) **Osobennosti embriotoksicheskogo deistviya gerbitsidov - proizvodnykh 2,4-dikhlorfenoksiuksusnoi kisloty. [Characteristic features of embryotoxic effect of herbicides - derivatives of 2,4-dichlorophenoxyacetic acid].** *Gig. Sanit.* 44(4): 70-71; 1979. (5 references) (Russian)

The results of a comparative study of embryotoxicity of the sodium, amine and ammonium salts and the butyl ester of 2,4-D are presented. Pregnant albino rats received single ig doses of herbicides at 0.5 LD50 on day 4, 5, 6, 9, 10, 11, 12, 13, 14 or 15 of pregnancy. In chronic experiments, rats received herbicides daily at maximum permitted dosages throughout the enire pregnancy. It was found that amine and sodium salts of 2,4-D did not affect development of rat embryos, while the ammonium salt and especially the butyl ester of 2,4-D caused a significant increase in the postimplantation mortality.

79-2155. Orecchio, F.; Togna, G.; Di Battista, L.; Villa, P.; Ficarra, M. G. (Ist. Ig., Univ. Cattol. S. Cuore, Rome, Italy) **Azione biologica dei ditiocarbamati: effetto dell'etilene bisditiocarbamato di zinco (zineb) sulla tossicita acuta del parathion e del paraoxon nel topo. [Biological effects of dithiocarbamates: zinc ethylenebis dithiocarbamate and parathion and paraoxon acute toxicity in mice.]** *Ig. Mod.* 72(3): 305-310; 1979. (11 references) (Italian)

Zineb-parathion and zineb-paraoxon interaction was studied on mice by determining how pretreatment with 1.5 and 10 mg/kg zineb administered 15 days affected LD50 of parathion and paraoxon toxicity. Parathion LD50 was not altered significantly but the median survival time was extended. In the case of paraoxon, pretreatment with zineb reduced LD50 and shortened median survival time. The authors attribute these effects to inhibition of mixed function oxidase metabolism in the liver. While pretreatment slowed down the oxidation of parathion to paraoxon, which is 100 times more toxic, and thereby extended survival time, it also slowed down the second detoxification step from paraoxon to paranitrophenol and thereby intensified the lethal effect of paraoxon.

79-2156. Vadlamudi, V. P.; Paul, B. S. (Punjab Agric. Univ., Ludhiana 141004, India) **A note on oral toxicity of *O,O*-dimethyl *O*-(3-methyl-4- nitrophenyl) phosphorothioate and its effect on blood cholinesterases in Indian buffalo.** *Indian J. Anim. Sci.* 48(1): 59-61; 1978. (10 references)

Buffaloes were administered fenitrothion at dose rates of 100, 175, 200, 225, 250 and 300 mg/kg. All calves were kept off feed for the 24 hr period prior to administering the drug. Observation continued for 14 days following treatment. Those receiving 200 mg/kg or higher doses exhibited toxic signs such as excitement, salivation, muscular tremors, lack of coordination, rigidity of limbs, swaying movements, convulsions, dyspnea, paralysis, coma and death. Severe hemorrhagic enteritis, frothy exudate in respiratory passages and distended gall bladder were noted. Activity of both cholinesterases was inhibited in all dose rates. These activity levels returned to normal 14 days after the administration of the 175, 200, and 225 mg/kg dose levels.

79-2157. Koundinya, P. R.; Ramamurthi, R. (Dep. Zool., S. V. Univ. Coll., Tirupati, India) **Tissue respiration in *Tilapia mossambica* exposed to lethal (LC50) concentration of sumithion and sevin.** *Indian J. Environ. Health* 20(4): 426-428; 1979. (8 references)

Tilapia mossambica were exposed to sevin (carbaryl) and sumithion (fenitrothion) at LC50 concenrations, 10 mg/l and 6 mg/l, respectively. Tissue respiration was depressed by both compounds. Greater depression was noted in the gill, liver and brain tissues as compared to the kidney, muscle and intestine. It is suggested that exposure to these two chemicals caused metabolic depression.

79-2158. Matin, M. A.; Kar, P. P. (Ind. Toxicol. Res. Cent., Lucknow, India) **Modification of DDT induced convulsions and neurochemical changes by barbiturates in rats.** *Indian J. Physiol. Pharmacol.* 22(2): 166; 1978.

The effects of barbiturates on DDT-induced convulsions and neurochemical changes in rats were studied. Phenobarbitone eliminated the convulsive effect of DDT while raising the level of cerebral free ammonia. The brain acetylcholine levels remained normal. The severity of DDT-induced convulsions was decreased by prominal, which slightly reduced the brain acetylcholine concentrations while raising the levels of ammonia. Primidone had no effect on DDT-induced convulsions in rats. Ammonia levels of the brain were increased with primidone, but acetylcholine levels were found to be their lowest with this drug. Phenobarbitone afforded the maximum protection against the effects of DDT in rats, followed by prominal, and then primidone.

79-2159. Fhaolain, I. N.; Coughlan, M. P. (Dep. Biochem., Univ. Coll., Galway, Ireland) **Further observations on the effects of *s*-triazine deviatives on purine metabolizing enzymes.** *Int. J. Biochem.* 9(9): 659-662; 1978. (19 references)

Enzymes isolated from turkey livers were assayed for activity in the presence of *s*-triazine derivatives. Xanthine dehydrogenase was completely inhibited. The derivatives in sequence of most effective to least effective are ammeline >

ammelide > allantoxaidin > cyanuric acid > melamine. No inhibition was observed for oxonate. The enzymic site of oxidizine substrate interaction, determined by the differential effects of ammelide on NADH oxidoreductase activity, is the molybdenum prosthetic groups. Purification of urate oxidase was not successful using affinity chromatography with oxonate coupled to aminopropyl-Sepharose.

79-2160. Barker, R. J.; Lehner, Y.; Kunzmann, M. R. (Bee Res. Lab., Sci. & Educ. Adm., USDA, Tucson, AZ 85719) **Interactions of collection technique, anesthesia, and antidote on survival of caged honey bees fed parathion or paraoxon.** *J. Econ. Entomol.* 71(6): 975-977; 1978. (4 references)

With *Apis mellifera* L. workers, significant interactions of lethal effects were found between age, carbon dioxide anesthesia, exposure to PAM (pyridine -2- aldoxime methidodide), and exposure to parathion and paraoxon. Bees were poisoned by 15-min exposure to carbon dioxide anesthesia; foragers were less susceptible than hive bees. Contrary to published reports, 0.4% PAM is not an antidote for parathion or paraoxon; it is toxic. (Author abstract by permission)

79-2161. Kozik, M. B.; Grottel, K. (Auton. Div. Pathol. Cent. Nerv. Syst. & Sens. Org., Med. Acad., Poznan, Poland) **Alterations of dendritic spines following intoxication by mercury phenylacetate.** *J. Hirnforschung.* 19(6): 539-541; 1978. (7 references)

Adult Wistar rats were exposed to mercury phenylacetate (PMA) ig at dose levels of either 0.1 or 0.05 g for 10 and 30 days, respectively. Exposure to PMA for 10 days deformed the dendritic spines considerably. This exposure also decreased the number of dendritic spines. Some of the spines from the first segment were thinned and those from the second and third segment of apical dendrites displayed a marked shortening with occurrence of irregular knots. When the animals were exposed chronically, the alterations of spines of apical dendrites became more pronounced. Unchanged spines were rarely found and the number of spines was greatly reduced.

79-2162. Vesely, D. L.; Watson, B.; Levey, G. S. (Div. Endocrinol. & Metab., Univ. Arkansas Med. Sci., Little Rock, AR) **Activation of liver guanylate cyclase by paraquat: possible role of superoxide anion.** *J. Pharmacol. Exp. Ther.* 209(1): 162-164; 1979. (22 references)

The stimulation of hepatic guanylate cyclase activity by paraquat was investigated. Homogenates of rat liver were centrifuged, and paraquat with various additions of KCN, catalase and BHT (butylated hydroxy toluene) was added to the supernatant. Guanylate cyclase activity was determined after 10 min incubation at 37°C using radioactive GMP. Paraquat in the concentration range of 0.005 to 1 m*M* caused an 80% increase in the activity of guanylate cyclase activity. The role of superoxide dismutase in increased enzyme activity was tested by addition of KCN, a known superoxide dismutase inhibitor, and catalase, which decreases the levels of hydrogen peroxide. Neither agent affected the activation of paraquat. BHT, a scavenger of hydroxyl radicals, stimulated guanylate cyclase activity without inhibiting the stimulation of the enzyme by paraquat. Superoxide dismutase at levels of 1 μg in combination with paraquat blocked the activation of the herbicide in the presence of guanylate cyclase. These results suggest that the activation of paraquat may not require H_2O_2, and may not depend on hydroxyl radical formation.

79-2163. Ohmiya, Y.; Koga, K. (Dep. Pharmacol., Sch. Med., Akita Univ., Akita 010, Japan) **Protein-mediated transfer of DDT to adipose tissue.** *J. Toxicol. Sci.* 3:31-38; 1978. (3 references)

Uptake of radioactive DDT was measured in various tissue slices from male Wistar rats. The highest DDT uptake was found in the adipose tissue followed by the liver, diaphragm and brain tissues in descending or r. The maximum uptake was noted after more than 4 hr in all four tissues. When lipid was present in the medium the uptake of DDT was drastically reduced by adipose tissue. Albumin accelerated the transport of DDT to adipose tissue. Hemoglobin and γ-globulin showed a lesser accelerating activity. Little or no effect was caused by protamine, trypsin, or pepsin. Only a small amount of DDT was taken up by the adipose tissue when the Krebs-Ringer solution was replaced by triglyceride suspensions. It is suggested that lipid may play an important role as a storage site of DDT and albumin may behave as a DDT-carrier protein in the organism.

79-2164. Gilman, A. P.; Hallett, D. J.; Fox, G. A.; Allan, L. J.; Learning, W. J.; Peakall, D. B. (Toxic Chem. Div., Can. Wildl. Serv., Dep. Fish. & Environ., Ottawa, Ontario K1A 0E7, Canada) **Effects of injected organochlorines on naturally incubated herring eggs.** *J. Wildl. Manage.* 42(3): 484-493; 1978. (32 references)

Herring gull eggs were collected and organochlorine (OC) contaminants were extracted. The extracted OC samples were injected into the eggs of uncontaminated gull eggs and the eggs were incubated by their natural parents. Synthetic mixtures of OC were also injected into some eggs. These mixtures were of three types: two contained the OC (PCBs, DDE, mirex, photomirex, and hexachlorobenzene) at two levels found in contaminanted eggs, and the third contained all the OC except PCBs. Uptake of OC by embryos was the same as reported in naturally contaminated eggs. The injections, however, did not cause any increase in embryonic or chick mortality. Reproductive failure in herring gulls is discussed.

79-2165. Watkins, M. S.; Solomon, K. E.; Robel, R. J. (Div. Biol., Kansas State Univ., Manhattan, KS 66506) **Effects of parathion and dieldrin on energetics of bobwhites.** *J. Wildl. Manage.* 42(3): 494-499; 1978. (16 references)

Adult male bobwhite quail, maintained in controlled environments, were dose with pesticides in three experiments: (1) parathion under summer conditions; (2) dieldrin under summer conditions; and (3) dieldrin under winter conditions. In experiment 1, birds were given 100, 250, or 400 μg parathion/kg body weight every other day for 4 days and were maintained at 25°C, 14.5 hr light:9.5 hr dark photoperiod and a 68% relative humidity. In experiment 2, birds were given 50, 100 or 150 μg dieldrin/kg every other day for 10 days at the same environmental conditons as above. In experiment 3, birds were given 50, 100 or 150 μg dieldrin/kg every other day for 10 days at 1°C, 10 hr light:14 hr dark photoperiod and 68% relative humidity. Gross energy intake, energy excretion, energy metabolism and metabolic efficiencies were not altered by either pesticide. The 150 μg dieldrin/kg dose caused reduced body weight under summer conditions.

79-2166. Reuber, M. D. (Chem. Carcinog. Program, Frederick Cancer Res. Cent., Frederick, MD 21501) **Carcinomas of the liver in Osborne-Mendel rats ingesting methoxychlor.** *Life Sci.* 24(15): 1367-1371; 1979. (29 references)

Osborne-Mendel strain male and female rats ingested dietary levels of 10, 25, 100, 200, 500, or 2000 ppm methoxychlor for periods of 104 wk. Carcinomas resulted in the livers of female treated rats. Carcinomas of the liver were also noted in 3 of 8 males ingesting 2000 ppm methoxylchlor. Severe diffuse hyperplasia was increased in rats given 25 ppm, and more significantly increased in rats given 2000 ppm methoxychlor. Carcinomas of the ovary were noted in 5 of 10 females ingesting 500 ppm and in 1 of 10 ingesting 100 ppm. Carcinomas were also noted in the mammary gland and lymphosarcomas were generally found in the lungs.

79-2167. Saad, S. F.; El Tayab, I. B.; Mustafa, A. (Dep. Pharmacol., Fac. Pharm., Khartoum Univ., Khartuum, Sudan) **Investigation of the effect of chlorophenothane and certain chemically related compounds on the cerebral γ-aminobutyric acid contents in rats.** *Pol. J. Pharmacol. Pharm.* 30(4): 469-474; 1978. (24 references)

Male albino rats were exposed to *p,p'*-DDT, *o,p'*-DDD (TDE), *p,p'*-DDD, DTE, DCPM, or DCP at concentrations of 600 mg/kg/day. Determinations of brain GABA content were made 3 hr after drug administration. The mean GABA content in cerebral hemispheres of 6 normal adult male rats was 155.17 μg/g wet tissue. At 1, 3, and 6 hr following oral administration of *p,p'*-DDT, decreases were noted in the brain GABA content, with these decreases significant at 3 and 6 hr, being 24 and 17.4%, respectively. Fine tremors were noted of the head at 3 hr, and then of the whole body. By hour 6 animals demonstrated clonic convulsions lasting about 5 sec. The five compounds structurally related to *p,p'*-DDT did not show a uniform effect. Only DTE significantly depressed brain GABA content. More marked central stimulating effects were noted after treatment with DTE than with *o,p'*-DDD, *p,p'*-DDD, DCPM or DCP.

79-2168. Doboszynska, B.; Kolodziejska, D.; Lipka, E. (Dep. Hyg. & Epidemiol., Med. Acad. Gdansk, P-85034 Bydgoszcz, Poland) **The study of the influence of DDT on the antirachitic activity of vitamin D in rats.** *Pol. J. Pharmacol. Pharm.* 30(4): 489-491; 1978. (16 references)

Acute rachitis was induced in young Wistar rats. Subsequently, the test animals were treated with different doses of vitamin D_3. Of the four groups tested, three were exposed to 1.6, 2.0, or 16.0 μg DDT in the cod-liver oil carrying the vitamin D_3. No adverse effects of DDT on the therapeutic action of vitamin D_3 were noted. It was concluded that the amounts of DDT found in cod-liver oil would not abolish the antirachitic activity of the vitamin D_3 present.

79-2169. Toth, K.; Bence, J.; Somfai-Relle, S. (Res. Inst. Oncopathol., Budapest, Hungary) **Carcinogenic bioassay of the herbicide, 2,4,5-trichloro phenoxyethanol (TCPE) with different 2,3,7,8-tetrachloro dibenzo- *p*-dioxin (dioxin) content in Swiss mice.** *Prog. Biochem. Pharmacol.* 14: 82-93; 1978. (12 references)

Chronic experiments were performed to study the carcinogenic effect of 2,4,5-trichloro phenoxyethanol (TCPE) and dioxin and to determine whether their carcinogenic effects are dose-dependent. Swiss-H/Riop mice were divided into 12 groups for the treatment. Each group comprised 100-100 males and females, respectively. The TCPE was suspended in a salt solution containing 0.5% carboxymethyl cellulose. Different doses of TCPE and dioxin were administered to the various groups of mice. Both compounds were administered by gastric intubation, once a week over a period of 1 yr. During the experiment, a detailed autopsy was performed on dead or moribund animals and the autopsy was followed by histologic examination of all organs. Pathological findings of groups treated with TCPE and/or dioxin were statistically analyzed at the end of the treatment period. Mice given the maximum tolerable dose of TCPE (70 mg/kg) with a dioxin content of 0.7 μg/kg had double the number of liver tumours as compared to the controls. A high dose of dioxin (10μg/kg) alone caused 3 cases of post-necrotic liver cirrhosis and 8 cases of dermatitis assocated with secondary amyloidosis.

79-2170. Larson, P. S.; Egle, J. L., Jr.; Hennigar, G. R.; Lane, R. W.; Borzelleca, J. F. (Dep. Pharmacol., Med. Coll. Virginia, Virginia Commonwealth Univ., Richmond, VA 23298) **Acute, subchronic, and chronic toxicity of chlordecone.** *Toxicol. Appl. Pharmacol.* 48(1): 29-41; 1979. (23 references)

Oral LD50 values were 132 mg/kg for male rats, 126 mg/kg for female rats, 71 mg/kg for male rabbits, and approximately 250 mg/kg for dogs. The percutaneous LD50 for male rabbits was 410 mg/kg. Deaths were preceded by the development of severe tremors. Gross autopsy findings were essentially negative. Rats were fed chlordecone in concentrations of 1, 5, 10, 25, and 80 ppm for up to 2 yr. All rats fed 50 and 80 ppm died during the first 6 mo. Depressed growth occurred at concentrations as low as 10 ppm for females and

25 ppm for males. Food consumption tended to increase as the dietary concentration of chlordecone became greater. This effect was associated with a measured increase in the metabolic rate. Concentrations of 5 ppm and higher accelerated and intensified the rate of development of proteinuria. Increased liver- to-body weight ratios were consistently observed. Elevated ratios for other organs measured (kidney, heart, spleen, and testes) were found at certain periods, but at higher chlordecone concentrations than required for liver. Principal histopathologic findings in rats were degenerative changes in liver cells (fatty changes, hyperplasia), kidney lesions (primarily glomerulo sclerosis), and testicular atrophy. Hematocrit and hemoglobin values were reduced in rats receiving concentrations of 25 ppm and above. There was no evidence of a clotting defect, although some rats receiving 50 and 80 ppm showed a bleeding tendency. Beagle dogs fed chlordecone at concentrations of 1, 5, and 25 ppm for period up to 127 wk exhibited few gross or histopathologic signs of toxicity. (Author abstract by permission)

79-2171. Abou-Donia, M. B.; Graham, D. G. (Dep. Pharmacol. & Pathol., Med. Cent., Duke Univ., Durham, NC 27710) **Delayed neurotoxicity of *O*-ethyl *O*-4-nitrophenyl phenylphosphono thioate: toxic effects of a single oral dose on the nervous system of hens.** *Toxicol. Appl. Pharmacol.* 48(1): 57-66; 1979. (23 references)

Delayed neurotoxicity was produced in hens, following the administration of a single oral dose of technial (85%) EPN (*O*-ethyl *O*-4-nitrophenyl phenylphosphono thioate) in a gelatin capsule. Doses ranged from 25 to 500 mg/kg (2.5-50 times the LD50). These hens also received multiple doses of atropine sulfate to protect them against acute toxicity. Hens given the smaller doses of EPN showed only ataxia, while a few of those treated with the larger doses progressed to paralysis and death. Histologic examination showed marked axon and myelin degeneration in the sciatic nerve and spinal cord of some hens. The lesions in the peripheral nerves were generally observed earlier than those in the spinal cord. Hens given only 10 mg/kg of EPN (LD50 value) and small doses of atropine sulfate did not show neurologic signs of delays neurotoxicity nor histological changes. Controls consisted of four groups of hens given a single dose of 500 mg/kg of tri-*o*- cresyl phosphate (TOCP), 10 mg/kg of parathion (*O,O*-diethyl *O*-4-nitrophenyl phosphoro thioate), 300 mg/kg of atropine sulfate, or an empty gelatin capsule. TOCP-treated hens developed delayed neurotoxicity while those given parathion showed initially leg weakness but subsequently recovered without developing delayed neurotoxicity. Controls receiving atropine sulfate and gelatin capsule remained normal. Plasma cholinesterase activity was significantly reduced in all surviving hens 90 days after the administration of a single dose of TOCP or EPN, except in birds given 10 mg/kg of EPN. This enzyme was not affected in atropine sulfate or parathion control hens. (Author abstract by permission)

79-2172. Hayashi, E.; Okudaira, H.; Yamada, S. (Dep. Pharmacol., Shizuoka Coll. Pharm. Sci., Shizuoka 422, Japan) **Protection by a carbamate against inactivation of cholinesterase and against the induction of supersensitivity of the ileum to acetylcholine produced by repeated administration of an organophosphate.** *Toxicol. Appl. Pharmacol.* 48(1): 111-116; 1979. (14 references)

The effects of repeated administration of prophaphos (an organophosphorus cholinestease inhibitor) and 2-*sec*- butyl phenyl- *N*- methylcarbamate (BPMC, a carbamate cholinesterase inhibitor) on the pharmacological responsiveness of the ileum and on the cholinesterase activity in blood and tissues were investigated in guinea pigs. Propaphos (0.33 μM) and BPMC (4.8 μM) each inhibited the cholinesterase activity in blood *in vitro* and enhanced the contractile response to guinea pig isolated ileum to acetylcholine (ACh). After repeated administration of a sublethal dose (5 mg/kg/day po) of propaphos to guinea pigs for 7 days, the contractile response of isolated ileum to ACh (17 nM-17μM) was markedly increased and the values of ED50 and ED80 for ACh-induced contraction significantly decreased. Since the activity of cholinesterase in the ileum was markedly reduced in these animals, the depression of the enzyme may be the major factor underlying the observed supersensitivity to ACh. The propaphos-induced supersensitivity to ACh was significantly reduced by pretreatment with sublethal doses (25 mg/kg/day po, 7 days) of BPMC. In addition BPMC blocked a fraction of the inactivation of cholinesterase produced by propaphos acting *in vivo* on blood, brain, and ileum. Therefore it is possible that the BPMC-induced protection of cholinesterase might explain the mechanism by which the carbamate antagonizes the development of supersensitivity of the ileum to ACh following the administration of propaphos. (Author abstract by permission)

79-2173. Hanasono, G. K.; Moss, C. L. (Toxicol. Div., Lilly Res. Lab., Greenfield, IN) **The biotransformation and biliary excretion of ethalfluralin in male rats.** *Toxicol. Appl. Pharmacol.* 48(1): A7; 1979.

Ethalfluralin (E), *N*-ethyl- *N*-(2-methyl- 2-propenyl)- 2,6-dinitro- 4-(tri fluoromethyl) benzenamine, a dinitroaniline herbicide, is rapidly metabolized by rats. The peak plasma concentration of E (150 ng/ml) 2 hr after a single 100-mg/kg oral dose of ring-labeled [^{14}C]E represented less than 2% of the total plasma radiocarbon content. Peak tissue concentrations of radioactivity at 8 hr in liver > fat > kidney were all 2- to 3-fold higher than in plasma. Bile-fistula rats excreted about one-third of the radiolabeled dose of E in the bile as metabolites during a 24-hr period. Almost half of the biliary radioactivity collected was characterized as glucuronide conjugates. GC-MS and NMR analyses showed that a diol metabolie of E, *N*-ethyl- *N*-(2-methyl- 2,3-dihydroxy propyl)- 2,6-dinitro- 4-(tri fluoromethyl) benzenamine, was a major glucuronide metabolite in bile. Approximately half of the biliary radioactivity infused into the duodena of bile-fistula rats underwent enterohepatic circulation and reappeared in the 24-hr bile collection. [Abstract #14 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2174. Copeland, M. F.; Chadwick, R. W. (Health Eff. Res. Lab., US EPA, Research Triangle Park, NC 27711) **Comparative metabolism of lindane in rats following administration by two oral routes.** *Toxicol. Appl. Pharmacol.* 48(1): A8; 1979.

The comparative metabolism of lindane was studied in the rat following administration by gavage or incorporation in the diet. Lindane was administered to weanling female rats at the following dosages for 14 days: 1.96 mg/day by gavage or 130 ppm incorporated in the diet. Appropriate controls were run for each route of exposure. The rats receiving lindane in the diet excreted significantly more conjugated 2,4,6-trichlorophenol and 2,3,4,6- tetrachlorophenol as well as total urinary metabolites than rats receiving lindane by gavage. Rats receiving lindane by gavage excreted more unchanged lindane than rats receiving lindane in the diet. *In vitro* dehydrogenation and dechlorination of lindane as well as conversion of 1,2,3,4- tetrachlorobenzene to 2,3,4,5-tetra chlorophenol was significantly greater in rats receiving lindane in the diet than in rats receiving lindane by gavage. The route of oral administration had a significant effect on the metabolism of lindane. This was probably associated with the longer period of exposure, the greater absorption, and greater bioavailability of lindane in rats receiving the pesticide in their diet, which in turn, led to a significantly greater induction of specific metabolic pathways. [Abstract #15 of the 1979 annual meeting of the Society oy of Toxicology.] (Author abstract by permission)

79-2175. Lawrence, J.; Marshall, W. (Food Dir., Health Protect. Branch, Agric. Canada, Ottawa, Ontario, Canada) **Metabolism of ethyleneurea and ethylene thiourea in the rat.** *Toxicol. Appl. Pharmacol.* 48(1): A11; 1979.

Ethyleneurea (EU) and ethylenethiourea (ETU) have been identified as plant and animal metabolites of the ethylene bis dithiocarbamate fungicides. Previous work in the rat has shown that major urinary metabolites of orally administered ^{14}C-ETU are EU and 4-imidazolin- 2-one (imidazoline). The present study indicates that dehydrogenation of ^{14}C-EU, administered po, is extensive, yielding imidazole as the major urinary metabolite. This indicates that the major urinary metabolites arise after oxidative desulfuration of ETU. However, qualitative HPLC analysis of urine from rats given ETU po, reveals the presence of thioimidazole, which indicates that dehydrogenation can occur without formation of EU. The HPLC analysis also revealed the presence of additional, minor, sulfur containing metabolites, namely thiohydantoin, *N*-methyl ETU and *N*-methyl thioimidazole. These results indicate a complex pattern of metabolism for ETU in the rat. [Abstract #21 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2176. Winston, J. M.; Hong, C. B.; Minor, J. L.; Lee, C. C.; Seifter, J. (Midwest Res. Inst., Kansas City, MO 64110) **Effects of inhaled ethylene dibromide (EDB) on reproduction in rats.** *Toxicol. Appl. Pharmacol.* 48(1): A23; 1979.

Male CD rats inhaled 0, 19, 39, or 89 ppm of EDB 7 hr/day, 5 days/wk for 10 wk. Mortality, reduced weight gain, and reduced feed consumption occurred at the high concentration. These males had reduced serum testosterone levels, atrophy of the testes, epididymis, prostate, seminal vesicles, and failed to impregnant females. Reproduction was normal in males exposed to 19 or 39 ppm of EDB. Since these reproductive changes occurred with adverse effects on well-being, it was not possible to attribute reproductive effects directly to EDB. Female CD rats inhaled 0, 20, 39, or 80 ppm of EDB 7 hr/day, 7 days/wk for 3 wk. Mortality, weight loss, and reduced feed consumption occurred at the high concentration. These females did not cycle normally until several days after exposure ended and fewer females mated during a 10-day period than in other groups. Pregnant females in all groups produced normal litters. No lesions were observed in the ovary or uterus that would impair reproductive performance. [Abstract #45 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2177. Winston, J. M.; Hong, C. B.; Lee, C. C.; Wong, L. C. K. (Midwest Res. Inst, Kansas City, MO 64110) **Effect of 3- or 6-month inhalation of 1,2-dibromoethane in rats treated with disulfiram.** *Toxicol. Appl. Pharmacol.* 48(1): A25; 1979.

Sprague Dawley rats were exposed to filtered air or 20 ppm of 1,2-dibromoethane (EDB) with or without 0105% disulfiram (DS) in the daily diet. The rats were exposed to EDB 7 hr/day, 5 days/week for 3 or 6 mo. At 3 and 6 mo, rats were sacrificed and liver, spleen, kidney and reproductive organs were removed for histopathological examination. The tissue lesions in the EDB + DS rats included hepatocellular dysplasia, splenic atrophy, and atrophy of the testes at both 3 and 6 mo. The incidence of these lesions was higher in the EDB + DS rats than the other treatment groups. At both 3 and 6 mo, the EDB + DS rats were found to have reduced hematocrits, hemoglobin concentration and red blood cell counts. These data indicate that concurrent treatment with DS during EDB inhalation increases EDB toxicity. The changes in hematological parameters may serve as an early indicator of the toxicity of the EDB + DS combination. [Abstract #49 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2178. Gee, S. J.; Krieger, R. I.; Lim, L. O.; Wellings, S. R. (Dep. Environ. Toxicol., Univ. California, Davis, CA) **Disposition processes in mussels *Mytilus californianus.*** *Toxicol. Appl. Pharmacol.* 48(1): A31; 1979.

Uptake and accumulation of anutritive chemicals including organochlorine pesticides and PCBs, heavy metals, radionuclides and petroleum chemicals by marine mussels has been frequently observed and tissue levels measured as part of environmental monitoring programs. Studies of disposition processes are being conducted to determine biological consequences of anutritive chemical exposures. *Mytilus californianus* are being obtained from large uncontaminated

populations near Bodega Bay, CA. Using neutral red in static bioassays, containing 4 mussels in 1 l Instant Ocean, ventilation rates of 0.5-1 l/hr/mussel have been recorded. Antipyrine (6 μM) is distributed in body water, rapidly cleared (0.1 l/hr/6 mussels), and metabolized to a small extent (less than 4%) to 4-hydroxy antipyrine during test periods up to 6 hr. *In vivo* biotransformation of aldrin to dieldrin has been measured under field and laboratory conditions. Mussel tissue pieces of mantle, gill and green gland transformed more substrate than corresponding homogenates. Histological preparations of active mussel tissues will be presented. [Abstract #61 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2179. Khera, K. S.; Whalen, C.; Trivett, G.; Angers, G. (New Res. Cent., Health & Welfare Canada, Ottawa, Ontario, Canada) **Assessment of the teratogenic potential of biphenyl, ethoxyquin, piperonyl butoxide, diuron, thiabendazole, phosalone, and lindane in rats.** *Toxicol. Appl. Pharmacol.* 48(1): A33; 1979.

There are a number of pesticidal agents to which human exposure is highly likely and whose teratological potential remains to be determined. From these the following were investigated at the given doses; biphenyl (99.9%), ethoxyquin (unknown purity), piperonyl butoxide (80%), Karmex (80% diuron) or Mertect (45% thiabendazole) at 0, 125, 250 or 500 mg/kg; and Benesan (50% lindane) at 0, 6.25, 12.5 or 25 mg/kg. These doses were given orally by intubation as single daily administrations to rats from the sixth to the 15th day of pregnancy. The rats were necropsied at term. Fetuses were examined to obtain values on body weight, survival, intrauterine deaths and anomlies (external, visceral and skeletal) by using standard methods. Diuron was found to be associated with an increased incidence of wavy rib anomaly at the 250 mg/kg, and at the maternally toxic dose of 500 mg/kg. Otherwise, in all the remaining test groups, no adverse effects were observed on fetal development. [Abstract #66 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2180. Khera, K. S. (New Res. Cent., Health & Welfare Canada, Ottawa, Ontario, Canada) **Teratogenicity evaluation of commercial formulation of dimethoate (Cygon 4E) in the cat and rat.** *Toxicol. Appl. Pharmacol.* 48(1): A34; 1979.

Dimethoate (Rogor), an extensively used insecticide whose residues occur in a number of foods, was investigated for teratogenic activity. A commercial formulation containing 47.3% of dimethoate and 52.7% of unknown ingredients (Cygon 4E) was administered orally in single daily doses to cats from the 14th to the 22nd day of gestation and to rats from the sixth to the 15th day of gestation. The cats and rats were necropsied on the 43rd and the 22nd day of gestation, respectively. Fetal values on survival, body weight, and skeletal and visceral anomalies, were obtained by using standard methods. The highest dose, 12 mg/kg, was found associated in the cat with polydactyly in eight of the 39 fetuses. In the rat, an increased incidence of fetuses deformed with wavy ribs and other anomalies was noticed at 12 mg/kg, and at a maternally toxic dose of 24 mg/kg. However, 3 and 6 mg/kg doses of Cygon 4E, compared with control, produced no evidence of teratogenicity or embryotoxicity in the two species. [Abstract #67 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2181. Kapp, R. W., Jr. (Hazleton, Lab., American Inc., Vienna, VA) **Mutagenicity of 1,2-dibromo- 3-chloropropane (DBCP): *in vivo* cytogenetics study in the rat.** *Toxicol. Appl. Pharmacol.* 48(1): A46; 1979. (1 reference)

The halogenataed aliphatic hydrocarbon 1,2-dibromo- 3-chloropropane (DBCP) has been widely used as a soil fumigant. Studies have shown that DBCP is harmful to humans by various routes. To more clearly define the mutagenicity of this pesticide, three groups of 20 male rats were administered 0.73, 7.3 and 73 mg/kg/day of DBCP by gavage for 5 days. The high dose level was selected since it was the highest non-toxic dose (LD50 = 146 mg/kg). Positive and negative groups were utilized as reference controls. Colchicine (2 mg/kg) was administered ip to all animals 24-hr after the last dose. The rats were sacrificied 2 hr after the colchicine injection and spermatogonial and bone marrow cells were extracted, fixed in Carnoy's Solution, and flame-dried onto slides. Fifty cells from each tissue were examined from each aniamls that produced analyzable cells. Cytogenetic analysis was performed with the scorer unaware of the dosage levels or group assignments. A dose-related increase in the incidence of aberrant cells was evident in both cell types. These data indicate DBCP is a clastogenic agent in the rat. [Abstract #91 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2182. Dougherty, J. A.; Brock, W. J. (Grad. Cent. Toxicol., Lexington, KY) **Effects of d-amphetamine and paraquat in single spatial alteration performance.** *Toxicol. Appl. Pharmacol.* 48(1): A51; 1979.

The behavioral effects of orally administered d-amphetamine and paraquat were evaluated in rats by using an unsignalled single spatial alternation (SSA) procedure which allows assessment of both speed and accuracy of responding. SSA requires non-food deprived animals to obtain a 45 mg sucrose pellet by alternating responses between two retractable levers presented every 40 sec on a discrete trial basis. Rats were trained until a criterion of at least 70% accuracy in each daily session was attained. Low doses (0.5-10 mg/kg) of d-amphetamine were administered orally for 23 hr pre-session via drinking water. Dose dependent decreases in response speed (increases in latency) were found, but no significant effects on accuracy were seen. Response latencies returned to pre-drug values within two sessions after drug access. The effects of acute access to paraquat were also studied. Results from the d-amphetamine study indicate that this procedure provides toxicologically relevant, sensitive, and stable behavior for assessing the effects of drugs and environmental agents. [Abstract #102 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2183. Heimann, R.; Skornik, W.; Jaeger, R. J. (Sch. Public Health, Harvard Univ., Boston, MA 02115) **Biochemical changes in guinea pig lungs following exposure to plastic combustion products, paraquat, or ANTU.** *Toxicol. Appl. Pharmacol.* 48(1): A58; 1979.

The effects of polyvinyl chloride (PVC) or polystyrene (PS) combustion products on pulmonary aminopyrine demethylase (AD) and aniline hydroxylase (AH) were measured at 24 and 48 hr. Lung and liver to body weight ratio (LU/BW and LI/BW) and lung non-protein sulfhydryl (NPSH) were determined. Significant increases in LU/BW ratios were found after exposure to 0.5 and 0.75 g of technical PVC at 24 hr (24% and 35% respectively). A 25% increase in LI/BW occurred at 24 hr. AD and AH activities were highly variable. Lung NPSH levels did not change. PS caused an increase in LI/BW ratio at 24 hr only. No consistent changes in MFO, NPSH or LU/BW were seen. Paraquat (15 mg/kg, ip) resulted in no change in LU/BW at 1 or 4 hr. AD and AH were unchanged at 1 hr; AH decreased by 22% at 4 hr and 71% at 24 hr. At 24 hr AP was 23% of contol; NPSH level did not change. After ANTU (140 mg/kg, ip) AP activity increased at 4 hr but decreased to 51% at 24 hr. AH activity was 78% at 4 hr and 53% at 24 hr. No changes in LU/BW ratio or lung NPSH occurred. [Abstract #115 of the annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2184. Saito, K.; Parker, W. B.; Menzel, D. B. (Dep. Pharmacol., Med. Cent., Duke Univ., Durham, NC 27710) **Accumulation of paraquat and diquat by cultured Type II pneumocytes.** *Toxicol. Appl. Pharmacol.* 48(1): A58; 1979.

The accumulation of ^{14}C-paraquat and ^{14}C-diquat by three types of lung cells was studied. L-2 cells (adult rat lung cells) accumulated paraquat (1 m*M* extracellular concentration in Tyrode's solution at 37°C) with time to a maximum of 14.3 nmol/mg protein by 60 min. Diquat was accumulated slowly but reached a concentration of 7.2 nmol/mg protein by 30 min. AKD cells (feline embryonic lung cells) accumulated a maximum of 6.8 nmol paraquat/mg protein by 30 min but did not accumulate further paraquat on incubation up to 2 hr. A-549 cells (human lung carcinoma cells) also reached maximum paraquat accumulation by 30 min of 4.0 nmol/mg protein. Both AKD and A-549 cells accumulated less diquat. Cell viability was unaffected by up to 2 hr incubation with either paraquat or diquat. The site of cellular accumulation of paraquat by the lung may be the Type II cells. Species differences in the ability of Type II cells to accumulate paraquat and diquat may exist. Cultured Type II cells may be particularly useful in the study of lung toxicants. [Abstract #116 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2185. Pratt, I. S.; Keeling, P. L.; Smith, L. L. (Cent. Toxicol. Lab., ICI Ltd., Alderley Park, Cheshire, England) **The effect of high concentrations of oxygen on the toxicity of paraquat and diquat in rats.** *Toxicol. Appl. Pharmacol.* 48(1): A59; 1979.

It has previously been shown that high concentrations of O_2 enhance the toxicity of paraquat. We have examined the effect of paraquat (2.5 mg/kg and 20 mg/kg given sc) on the mortality of rats left in ambient air or placed in 85% O_2. The lethality of paraquat was found to be enhanced approximately ten-fold in 85% O_2. In contrast the lethality of diquat (10 mg/kg and 20 mg/kg given sc) was enhanced only two-fold in 85% O_2. The pathology in the lungs of the treated rats 24 hours after dosing with paraquat reflected the mortality data. The primary target cells following 20 mg/kg in air are the type I and type II alveolar epithelial cells whereas with 2.5 mg/kg in 85% O_2 the type II cells is the cell type primarily damaged although there is some effect on type I and endothelial cells. Diquat 20 mg/kg in air produces only very minimal cellular damage as does 10 mg/kg in 85% O_2 whereas 20 mg/kg in 85% O_2 more markedly damages type II cells. The importance of lung damage in the death of diquat treated rats in 85% O_2 is still unclear. [Abstract #117 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2186. Kehrer, J. P.; Haschek, W.; Witschi, H. P. (Grad. Sch. Biomed. Sci., Univ. Tennesee, Oak Ridge, TN 37830) **Peracute toxicity of paraquat and diquat in 100% oxygen.** *Toxicol. Appl. Pharmacol.* 48(1): A59; 1979.

While the enhancement of paraquat toxicity by oxygen has been studied, less is known about the effects of oxygen in acute diquat poisoning. Rats were injected iv with either paraquat or diquat and placed into an atmosphere of 100% O_2. The LD50 for 5, 10, 20, 40 or 80 mg/kg of paraquat were 1360, 865, 666, 405 and 254 min and for diquat 3040, 1132, 703, 98 and 87 min. Following a dose of 10 mg/kg of either paraquat or diquat the plasma concentrations and tissue distribution were the same in animals kept in air or in oxygen. Histopathologic studies showed that the most prominent feature in lungs exposed to oxygen and either herbicide was a severe and general perivascular edema. Rats pretreated with endotoxin in a manner which makes them tolerant to hyperoxia exhibited decreased mortality to diquat treatment in oxygen. These data suggest that the primary site of the paraquat or diquat- oxygen interaction is the pulmonary endothelial cells. [Abstract #118 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2187. Montgomery, M. R.; Wyatt, I.; Smith, L. (Vet. Adm. Hosp., Minneapolis, MN) **Oxygen effects on active uptake and metabolism in rat lung slices.** *Toxicol. Appl. Pharmacol.* 48(1): A79; 1979.

High concentrations of O_2 *in vivo* potentiate paraquat (Pq) toxicity while low concentration may protect against the lung damage. Pq accumulation (accum.) into 0.50 mm slices of fresh rat lung was not altered by incubation for up to 4 hr in 85% O_2 (PO_2 = 645 mm Hg) compared to room air (PO_2 = 160 mm Hg). Reducing the incubation PO_2 below 100 mm Hg inhibited Pq accum. Incubation for up to 3 hr in atmospheres (atm.) of 100% N_2 completely inhibited Pq accum. When slices were placed in PO_2 > 10 mm Hg follow-

ing preincubation for 2 hr in 100% N_2, control rates of accum. (no preincubation in N_2) were obtained. Production of $^{14}CO_2$ from ^{14}C-glucose was also completely inhibited by 100% N_2 but progressed at control rates when slices were incubated in Po_2 = 160 mm Hg after preincubation in 100% N_2 for up to 2 hr. These values suggest that active accum. may require relatively high O_2 tensions compared to other O_2-dependent metabolic process. Lung slices are resistant to anoxia when returned within 2 hr to atm. containing O_2. [Abstract #157 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2188. Roth, R. A.; Wallace, K. B.; Alper, R. H.; Bailie, M. D. (Dep. Pharmacol. & Toxicol., Michigan State Univ., East Lansing, MI) **Paraquat (PQ) treatment alters disposition of 5-hydroxy tryptamine (5-HT) and angiotensin I (AI) by rat lung.** *Toxicol. Appl. Pharmacol.* 48(1): A79; 1979.

Although morphologic damage to both Type I and Type II alveolar pneumocytes has been commonly observed after PQ administration, disagreement exists as to whether PQ treatment alters vascular endothelium of lung. Since pulmonary dispositon of 5-HT and AI is a function of vascular endothelium, we examined the disposition of these agents by lungs of rats treated with PQ. Isolated lungs from rats treated with PQ dichloride (25 mg/kg, ip) 3 or 4 days before perfusion removed less perfused ^{14}C-5-HT (0.1 μM) than did saline injected controls. This effect was not caused by PQ directly since perfusion of lungs from untreated animals with PQ did not alter removal of co-perfused ^{14}C-5-HT. Monoamine oxidase activity of 600 x *g* supernatant fractions of lungs from PQ-treated rats was also reduced compared to controls. Although removal of perfused AI (1 ng/ml) by isolated lung was not altered by PQ pretreatment, angiotensin-converting enzyme activity in 600 x *g* supernatant fractions of lung was significantly reduced. These results suggest that PQ damages pulmonary endothelium and impairs the metabolic function of lung. [Abstract #158 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2189. Ross, J. H.; Gee, S. J.; Krieger, R. I. (Dep. Environ. Toxicol., Univ. California, Davis, CA) **Structure-activity correlations of paraquat homologues in the inhibition of aldrin epoxidation by rat liver microsomes.** *Toxicol. Appl. Pharmacol.* 48(1): A80; 1979. (1 reference)

To clarify the mechanism of paraquat's toxic action, the *N*-alkyl homologues of paraquat (viologens) were investigated for their ability to inhibit rat liver microsomal aldrin epoxidation and produce rat toxicity. Viologens were uncompetitive inhibitors of aldrin epoxidation. Lethal dose of viologens in rats can be related to the uncompetitive inhibitor's kinetic constant (Ki). Ki was closely related to the inductive effect of the alkyl side chains of the viologens. A correlation of Ki and the ability of the viologens to inhibit paraquat uptake into rat lung slices was excellent indicating dependence of both lung uptake and microsomal inhibition on a common physiochemical parameter of the viologens. An alternative mechanism of paraquat's toxic action that does not require lipid peroxidation is proposed based on current findings concerning the ability of viologens to shunt electrons from critical biochemical reactions. [Abstract #159 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2190. Lock, S.; Witschi, H. P.; Plaa, G. L. (Dep. Pharmacol., Univ. Montreal, Montreal, Quebec, Canada) **The effect of alcohol on te uptake of xenobiotics by the isolated perfused rabbit lung.** *Toxicol. Appl. Pharmacol.* 48(1): A81; 1979.

Previous studies have shown that the isolated perfused rabbit lung is capable of accumulating and metabolizing xenobiotics. It has also been shown that intratracheally administered compounds will enter the blood stream. It was of interest to know whether the addition of toxic amounts of ethanol (EtOH) to the perfusate of an isolated lung would alter the accumulation of model compounds by the lung or their passage from the airways into the blood stream. Blood and lungs from male New Zealand white rabbits (3-5 kg) were employed. Radiolabeled imipramine (3 μM/lung) or paraquat (3 μM/lung) were added to the perfusate containing 300 mg EtOH/100 ml. No changes in the rates of pulmonary accumulation of the compounds were observed. The lung is also susceptible to airborne xenobiotics. A lipid-insoluble compound ^{14}C-mannitol (1 μM/lung) and a lipid-soluble compound (^{35}S-sulfanilic acid) (5 μM/lung) were administered intratracheally to determine whether EtOH could influence their absorption. High EtOH concentrations did not affect their absorption. [Abstract #161 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2191. Shellings, W. M.; Pringle, J. L.; Dorko, J. D.; Kintigh, W. J. (CMIR, Pittsburgh, PA) **Teratology and reproduction studies with rats exposed to 10, 33, or 100 ppm of ethylene oxide (EO).** *Toxicol. Appl. Pharmacol.* 48(1): A84; 1979.

A teratology and one-generation reproduction study were performed at the same exposure concentrations as those in a chronic rat study, 0, 10, 33, and 100 ppm. From day 6 of gestation through day 15, bred Fischer 344 rats were exposed 6 hr/day. Fetuses were delivered by caesarean section at day 20 and evaluated for growth and viscral and skeletal development. Only male and female fetuses of rats exposed to 100 ppm had body weight significantly lower than that of the control. No developmental effects attributable to EO exposure were observed; therefore, EO was judged not to be teratogenic at these exposure concentrations. In the reproduction study, male and female weanling rats were exposed 6 hr/day, 5 days/wk for 12 wk. These rats were mated, and exposure was continued through day 19 of gestation. The dams were not exposed during the first 5 days of lactation. From day 5 through day 21 postpartum, they were separated from the pups and exposed to EO. Only the female rats exposed to 100 ppm of EO had a longer gestation period, reduced fertility index and significantly fewer pups. No differ-

ences were noted in any treatment versus control level for gestation survival or postpartum survival indices. [Abstract #167 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2192. Silkworth, J. B.; Loose, L. D. (Inst. Comp. & Human Toxicol., Albany Med. Coll., Albany, NY 12208) **PCB and HCB induced alteration of lymphocyte blastogenesis.** *Toxicol. Appl. Pharmacol.* 48(1): A86; 1979.

Since polychlorinated biphenyl (PCB) and hexachlorobenzene (HCB) suppress humoral immunity and host defense, the influence of these chemicals on cell mediated immunity was assessed. C57Bl/6 mice were fed 167 ppm PCB 1016 or HCB for 41 wk. Spleen cells were isolated and examined for their ability to respond to H2 alloantigens (Balb/c, BDF_1) in a one way mixed lymphocyte culture (MLC) and to respond to mitogen (PHA-M, LPS) stimulation. Spleen cells from mice fed PCB for 24 wk demonstrated a 56% enhancement of the MLC response to BDF_1 lymphocytes, whereas spleen cells from HCB treated mice demonstrated a 46% depression of the MLC response to Balb/c and BDF_1 cells. Spleen cells from mice fed PCB for 13, 24, or 41 wk demonstrated a time dependent enhancement of up to 64% above control values of mitogen responsiveness, whereas spleen cells from mice fed HCB demonstrated a transient suppression of up to 71% below control values which returned to control values after 41 wk. These findings indicate that chronic exposure to these chemicals can modify cell mediated immune mechanisms. [Abstract #172 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2193. Cranmer, J. S.; Avery, D. L.; Barnett, J. B. (Dep. Pharmacol., Univ. Arkansas Med. Sci., Little Rock, AR) **Persistent postnatal effects on the immune system following prenatal exposure to the anticholinesterase pesticides diazinon or carbofuran.** *Toxicol. Appl. Pharmacol.* 48(1): A88; 1979.

Progeny derived from hybrid mice treated with 0, 0.18 or 9.00 mg/kg/day diazinon or 0, 0.01 or 0.50 mg/kg/day carbofuran were overtly normal at birth. When sacrificed at 3, 15 or 24 mo of age, changes were recorded in the serum concentrations of IgG1 and IgG2a immunoglobulins of the offspring of mothers receiving either pesticide. The IgG1 and IgG2a concentrations of male offspring were generally increased, while those of female offspring were decreased. No systematic dose-effect relationship was observed for the range of doses tested. Treatment effects were most apparent at 3 mo of age. No effects of pesticide exposure on IgM or IgG2b concentrations were found, but the IgA levels of female offspring exposed to 0.01 mg/kg/day carbofuran were found to be elevated at 15 mo of age. [Abstract #176 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2194. Talcott, R. E.; Mallipudi, N. M. (Div. Toxicol. & Physiol., Dep. Entomol., Univ. California, Riverside, CA) **Inactivation of esterases by impurities isolated from technical malathion.** *Toxicol. Appl. Pharmacol.* 48(1): A92; 1979.

Purified malathion insecticide is relatively non-toxic to mammals, but technical formulations contain several impurities that may inhibit malathion detoxication. In this study, four compounds that were previously isolated from technical malathion effectively inactivated rat serum malathion carboxylesterase, rat serum cholinesterase and rat liver carboxylesterase *in vitro* and *in vivo*. These inactivators are, in increasing order of potency, *O,O,S*-trimethyl phosphoro dithioate, *O,O,S*-trimethyl phosphoro thioate, *O,O,S*-trimethyl phosphoro dithioate, and *O,S*-dimethoyl *S*-(1,2-dicarboethxy) ethyl phosphoro dithioate (isomalathion). *In vivo*, three of these compounds produce transient depressions of serum esterase activities, but one compound, *O,O,S*-trimethyl phosphoro thioate, produced long-lived esterase activity diminutions. Isomalathion, the most potent of the rat esterase inactivators, also inactivated a human liver malathion carobxylesterase preparation. These results support the view that isomalathion is a toxicologically significant impurity of technical malathion. [Abstract #184 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2195. Rozman, K.; Mueller, W. F.; Coulston, F.; Korte, F. (Inst. Oekol. Chem., Gesellsch. Strahlen. & Umweltforsch. mbH, D-8042 Munich, BRD) **The involvement of the lymphatic system in the absorption, transport, and excretion of hexachlorobenzene in rats and rhesus monkeys.** *Toxicol. Appl. Pharmacol.* 48(1): A93; 1979.

The uptake of hexachlorobenzene (HCB) from the gastrointestinal tract by lymph was studied in rats and rhesus monkeys. In both species, lymphatic absorption is the predominant uptake mechanism. An equilibrium between lymph and adipose tissue concentrations was established. A steady increase in the fecal excretion of unmetabolized HCB could not be accounted for by biliary excretion. A parallel increase in HCB concentrations in the intestinal content and in adjacent lymph nodes from the small intestines to the colon, which was found 2 wk after a single oral dose of HCB, indicates direct excretin of HCB into the intestinal lumen via the lymph. Based on this excretion mechanism, an explanation is proposed for the greatly enhanced excretion of stored HCB by rats and monkeys on a paraffin-fortified diet. [Abstract #185 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2196. Chadwick, R. W.; Copeland, M. F.; Rosenstein, L. (Health Eff. Res. Lab., US EPA, Research Triangle Park, NC 27711) **Dose-response effect from Kepone exposure during gestation and lactation on the metabolism of lindane by weanling rats.** *Toxicol. Appl. Pharmacol.* 48(1): A93; 1979.

Due to extensive environmental contamination involving Kepone (chlordecone), information regarding the effect of exposure to this pesticide, during gastation and lactation, on the metabolism of other toxicants is important. Timed pregnent Sprague-Dawley rats, individually housed,

received daily po doses of either 0, 0.1, 1.0, or 1.5 mg Kepone/kg from day 2 of gestation to day 21 post parturition. At day 21, 5 female pups from each treatment group were transferred to individual metabolism cages and all were dosed with 1.66 mg lindane (containing 1.81 μCi ^{14}C-lindane). Within 24 hr there was a significant dose-related increase in excretion and a decrease in the tissue storage of radioactivity. Exposure to Kepone also resulted in dose-related increases in the proportion of PCCOL, 2,3,4,6- and 2,3,4,5-tetrachlorophenol and a decrease in the proportion of 2,4,6- trichlorophenol excrethed. Results of this study indicate that exposure to Kepone during gestatin and lactation can significantly alter the detoxification of other environmental chemicals. [Abstract #186 of the 1979 annual meeting of the Society of Toxcology.] (Author abstract by permission)

79-2197. Koschier, F. J.; Stokols, M. F.; Cattrall, P.; Acara, M.; Hong, S. K. (Sch. Med., State Univ. New York, Buffalo, NY 14214) **Transport of *bis*-(*p*-chlorophenyl)- acetic acid (DDA) in the isolated, perfused rat kidney.** *Toxicol. Appl. Pharmacol.* 48(1): A94; 1979.

Since DDA has been shown to be transported and concentrated by the renal proximal tubule, this metabolite of DDT has been postulated to be a potential nephrotoxic agent. The present study explored the renal transport of DAA in the perfused rat kidney. When DDA (0.6 μ*M*) was present in a dextran perfusate which elimated DDA-colloid binding, the DDA/inulin clearance ratio was = 0.05. In addition, DDA had no effect on the glomerular filtration rate and the fractional reabsorption of Na, K or H_2O. To determine the concentration of DDA which would produce an effect on renal cellular function, studies were performed with renal cortical slices. DDA at media concentrations > 0.1 m*M* were needed to produce significant alterations in tissue oxygen consumption and intracellular electrolyte composition. In conclusion, DDA at a 0.6 μ*M* perfusate concentration undergoes net tubular reaborption without affecting renal function. Only high concentrations of DDA were shown to produce alterations in cellular function. [Abstract #188 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2198. Grabowski, C. T. (Dep. Biol., Univ. Miami, Coral Gables, FL) **Prenatal detection of cardiac pathology in mirex-fed rats using fetal electrocardiography.** *Toxicol. Appl. Pharmacol.* 48(1): A118; 1979.

The insecticide mirex induces conspicuous fetal edema but little visible teratology. It also reduces perinatal viability. Evidence of considerable developmental toxicity was found using a physiological criterion. Sperm positive rats were intubated with mirex in oil (5-10 mg/kg on days 8.5-15.5). Controls were untreated or oil-fed. Fetuses were sequentially exposed and ECG's were obtained with fetus attached to the uterus. Swollen fetuses were rated on a scale of 1 to 5. ECG's from 81 controls and 205 mirex-fed fetuses were obtained on day 18.5. Mirex-fed fetuses exhibited edema-related tachycardia. The heart rat was 150/min in controls, 180 in slightly swollen and 224 in swollen fetuses. PR intervals increased with degree of swelling and with dose. The frequency of 1° heart block was dose-related, ranging from 20%, to 77%; 8% had 2° heart blocks; 3% showed sinus arrythmias; one had atrial flutter. ECG's from treated newborn rats show that the prenatal problems can lead to perinatal pathology. These data dmonstrate the usefulness of prenatal electrocardiography to detect development toxicity. [Abstract #236 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2199. Burek, J. D.; Murray, F. J.; Rao, K. S.; Crawford, A. A.; Beyer, J. S.; Albee, R. R.; Schwetz, B. A. (Toxicol. Res. Lab., Dow Chem. Co., Midland, MI 48640) **Pathogenesis of inhaled 1,2-dibromo- 3-chloropropane (DBCP) induced testicular atrophy in rats and rabbits.** *Toxicol. Appl. Pharmcol.* 48(1): A121; 1979.

The effects of DBCP on spermatogenesis were evaluated in rabbits and rats by inhalation exposure to 0.0, 0.1, 1.0 and 10.0 ppm of DBCP for up to 14 wk. The onset, severity and pathogenesis of testicular atrophy were studied by light and electron microscopy, by fertility breeding studies and by correlating these findings with semen evaluation. Rabbits exposed to 10 ppm had nearly complete atrophy by 8 wk. All stages of spermatogenesis were absent: seminiferous tubules were lined by relatively normal Sertoli cells; there were no germinal cells in the seminiferous tubules; lipid within the Leydig cells were increased. Rabbits exposed to 1.0 ppm for 14 wk had 50% reduction in testicular size, decreased spermatogenesis, and increased abnormal spermatocytes within the seminiferous tubules. Rats exposed to 10 ppm showed approximately a 50% decrease in testicular weights and a patchy decrease in spermatogenesis. Rabbits exposed to 0.1 and rats exposed to 0.1 and 1.0 ppm did not show any treatment-related testicular or reproductive alterations. [Abstract #242 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2200. Kociba, R. J.; Keyes, D. G.; Wade, C. E.; Kalnins, R.; Lisowe, R. W.; Dittenber, D. D. (Health & Environ. Res., Dow Chem. Co., Midland MI) **A two-year chronic toxicity and oncogenic study of 2,4,5-trichlorophenoxy acetic acid (2,4,5-T) in rats.** *Toxicol. Appl. Pharmacol.* 48(1): A136; 1979.

Sprague-Dawley rats ingesting 30 mg of purified 2,4,5-T/kg/day for up to 2 yr had decreased weight gain, increased kidney weights, increased urinary volume and porphyrin, plus slight morphologic changes in kidney, liver and lungs. Parameters unaffected included mortality, food consumption, palpable masses, hematology, urinalysis, serum chemistry, tumor incidence and gross and microscopic morphology of all organ systems (except as described above). At the intermediate dose level of 10 mg/kg/day there were only minimal effects, limited primarily to the kidney. Rats given 3 mg/kg/day had no discernible effects as a result of the 2 yr treatment period. Thus, the results of this study revealed no oncogenic response in rats, even when administered a suf-

ficiently high dosage of 2,4,5-T to induce toxicity. [Abstract #271 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2201. Ecobichon, D. J.; Zelt, D. (Dep. Pharmacol. & Ther., McGill Univ., Montreal, Quebec, Canada) **The subacute and chronic toxicity of fenitrothion to male rats.** *Toxicol. Appl. Pharmacol.* 48(1): A136; 1979.

Reports conflict concerning the chronic toxicity of fenitrothion. Weaned male rats receiving peanut oil (control) or technical fenitrothion in oil at 0.5, 1, 5, 10 and 50 mg/kg/day by oral gavage for 12 mo. Ten control and 5 treated rats from each group were killed monthly for analysis of cholinesterase (ChE) (brain, plasma and erythrocytes) and carboxylesterase (CE) (liver, kidney) activities and fenitrothion residues (liver, kidney, perirenal fat). Brain, spinal cord and sciatic nerve were preserved for morphological examination. At 50 mg/kg, fenitrothion was acutely toxic to the rats within 3 days of starting treatment, a marked inhibition of tissue esterases being observed. Overt toxicity was not observed at the other doses though a dose-dependent inhibition of ChE and CE was measured at 1 mo and persisted afterward. At 3 mo, slower weight gain, excitability, pilorection and exophthalmos were observed at the 10 mg/kg/day dosage. Tissue residues of agent remained at the limit of detection by GLC. Tissues appeared normal by gross examination but histopathology in progress will assess possible central and peripheral nervous tissue damage. To date, there has been no physical evidence of neurotoxicity. [Abstract #272 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2202. Rao, K. S.; Murray, F. J.; Crawford, A. A.; John, J. A.; Potts, W. J.; Schwetz, B. A.; Burek, J. D.; Parker, C. M. (Toxicol. Res. Lab., Health & Environ. Res., Dow Chem. Co., Midland, MI 48640) **Effects of inhaled 1,2-dibromo-3-chloropropane (DBCP) on the semen of rabbits and the fertility of male and female rats.** *Toxicol. Appl. Pharmacol.* 48(1): A137; 1979.

Exposure of male workers to 1,2-dibromo-3-chloropropane (DBCP) has been associated with low sperm counts. The effects of inhaled DBCP on spermatogenesis and fertility and the possible reversibility of these effects was studied by exposure of rabbits and rats to 0, 0.1, 1, or 10 ppm of DBCP. Exposure of DBCP was for 14 consecutive wk with the exception of the 10 ppm rabbits which were exposed for only 8 wk. Results indicated a potential for inhaled DBCP to interfere with spermatogenesis in rats and rabbits. Rabbits had decreased sperm counts at 1 and 10 ppm between the 8th-14th wk of the study. All of the 10 ppm rabbits appeared to be infertile when mated during the 14th wk. A significant dominant lethal effect was seen in rats at 10 ppm as evidence by an increased incidence of resorptions among unexposed females mated with exposed males. Exposure has been completed and surviving animals are being monitored for the reversibility of the effects of DBCP on sperm counts in rabbits and fetal resorptions in rats. [Abstract #273 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2203. Marshall, T. C.; Dorough, H. W. (Grad. Cent. Toxicol., Univ. Kentucky, Lexington, KY 40506) **Comparative absorption and disposition of carbofuran, 3-hydroxycarbofuran and the glucoside of 3-hydroxycarbofuran.** *Toxicol. Appl. Pharmacol.* 48(1): A137; 1979.

Terminal carbamate insecticide plant residues to which humans are exposed are primarily of a water soluble (conjugated) and/or bound nature. The toxicological significance of such residues is largely dependent on absorbtion from the GI tract. An evaluation of the absorption and disposition of radiolabeled carbofuran (CF), 3-hydroxycarbofuran (3-OH CF), and 3-hydroxycarbofuran glucoside was conducted. After two days 20-30% of the dose of each compound was excreted in bile, approximately 60% in urine, and 0-4% in feces. Intestinal transit of these materials was determined following oral doses to rats as well as absorption using *in vivo* isolated GI segments. While CF and 3-OH CF were readily absorbed from all sections of the GI tract, the glucoside conjugate was directly translocated to the lower small intetine and cecum. At this point, cleavage of the glucosidic linkage occurred and the freed 3-OH CF (a potent cholinesterase inhibitor) was then absorbed. These investigations demonstrated that conjugates of carbamate insecticides formed in plants may provide a bioavailable source of toxic exogenous compounds if consumed in the diet of man and other animals. [Abstract #274 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2204. Rickard, R. W.; Dorough, H. W. (Grad. Cent. Toxicol., Univ. Kentucky, Lexington, KY 40506) **Formation and fate of nitrosamides in animals.** *Toxicol. Appl. Pharmacol.* 48(1): A138; 1979.

Previous studies showed that the guinea pig is a better model than the rat for nitroso studies since its low stomach pH is similar to that of man. Utilizing the guinea pig, studies were conducted to determine the extent of nitrosation of ^{14}C-methylurea and two carbamate insecticides, ^{14}C-carbofuran and ^{14}C-carbaryl. Each compound was readily nitrosated in the presence of guinea pig stomach contents; reaction of 0.5 μM of labeled compounds with 140 mM of $NaNO_2$ yielded approximately 25% nitrosation of each compound. *In vivo* yields of nitrosocarbofuran and nitrosocarbaryl (NC) in the stomach were $< 0.2\%$ but was 4.5% for nitrosomethylurea. The greater *in vitro* yields suggested that much of the *in vivo* synthesized nitroso compounds may have been degraded prior to extraction. NC in solutions of different pH exhibited maximum stability between pH 3-5. At pH 1.5, the pH of the guinea pig stomach content, NC was rapidly denitrosated to regenerate carbaryl. When NC was given orally to rats, 82% of the dose was excreted in the urine and 9% in the feces after 24 hr. This pattern of elimination is consistent with that obtained when carbaryl per se is administered to the rat. [Abstract #275 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2205. Stubblefield, W. A.; Dorough, H. W. (Grad. Cent. Toxicol., Univ. Kentucky, Lexington, KY 40506) **Quantitative administration of insecticide vapors to rats.** *Toxicol. Appl. Pharmacol.* 48(1): A138; 1979.

Pharmacokinetic studies in animals exposed via inhalation are hindered severely by difficulties encountered in quantitating the total dose inhaled and that portion which is retained. These were largely overcome in the present study by fitting rats with a facemask from which two tubes were extented. One tube was attached to the source of chemical vapors through which the animal inhaled. The other tube was attached to a polyurethane foam trap to collect chemicals in the expired air. Two one-way valves in the system prevented mixing of the inhaled and expired air. After exposure, the quantity trapped by the polyurethane foam represented expired chemical while the remainder of the dose was considered retained in the body. Studies with ^{14}C-chlordane and heptachlor demonstrated that 77% of a dose inhaled over a 30 min period was retained in the body. The percentage of the calculated retained dose found in the urine, feces and body after 7 days was 103 ± 9 for chlordane and 100.2 ± 2 for heptachlor. Thus, the method for calculating the retained dose proved to be quite accurate. Patterns of distribution and excretion were similar to that in rats treated orally with the compounds. [Abstract #276 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2206. Benson, W. H.; Dorough, H. W. (Grad. Cent. Toxicol., Univ. Kentucky, Lexington, KY 40506) **Comparative carbamate ester hydrolysis in four mammalian species.** *Toxicol. Appl. Pharmacol.* 48(1): A139; 1979.

Ester hydroylsis of carbamate insecticides destroys their anticholinesterase activity and is considered an important detoxification mechanism in mammals. In this study, the hydrolysis rates of carbaryl and Croneton (ethiofencarb) were examined in four species. Respiratory $^{14}CO_2$ resulting from the hydrolysis of orally administered ^{14}C-carbonyl-labeled carbamates (0.2 mg/kg) was taken as a measure of *in vivo* hydrolysis rates. Ester hydrolysis was greater for Croneton than for carbaryl in all animals, although the relative hydrolysis rates among species was the same with both compounds. After 24 hr, gerbils had hydrolyzed 91% of the Croneton and 56% of the carbaryl. Guinea pigs hydrolyzed somewhat less of the compound, 65 and 50%, but tests showed that gerbils and guinea pigs were more sensitive to carbamate poisoning than were rats and mice. These results do not necessarily minimize the role of ester hydrolysis in detoxification, but they do suggest that other important factors are involved in governing the inherent toxicity of carbamate insecticides to mammals. [Abstract #277 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2207. Courtney, K. D. (US EPA, Research Triangle Park, NC) **Postpartum CPK and LDH cardiac and serum isozymes after 2,4,5-T, carbaryl or aniline treatment.** *Toxicol. Appl. Pharmacol.* 48(1): A139; 1979.

CPK and LDH isozyme patterns in serum and cardiac tissue were determined day 1 and 20 postpartum (pp) in CD-1 mice after treatment, ig, with 2,4,5-T (100 mg/kg), carbaryl (100 mg/kg), during gestation or with aniline (150 or 200 mg/kg) during gestation and lactation. The serum CPK isozyme pattern was markedly altered in all treatment groups on day 1 pp. By day 20 pp, the abnormal alteration in pattern persisted in the carbaryl group, while the aniline group showed another abnormal pattern with the appearance of an additional enzyme. In contrast, the 2,4,5-T serum CPK pattern was not significantly different from the control pattern. The CPK cardiac isozyme patterns on day 1 pp of the carbaryl and aniline groups showed minimal changes while the 2,4,5-T pattern was normal. The cardiac LDH isozyme pattern showed changes of lesser magnitude on day 1 and 20 ppm. The serum LDH isozyme pattern did not differ significantly from control values on day 1 or 20 pp. Comparable changes were observed in the neonatal cardiac isozymes during development, with more changes in the CPK isozyme pattern than in the LDH isozyme pattern. [Abstract #278 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2208. Skalsky, H. L.; Keeling, B. M.; Borzelleca, J. F. (Dep. Pharmacol, Toxicol. Div., Med. Coll. Virginia, Richmond, VA) **The effects of parathion and carbofuran on cholinesterase activity in plasma, erythrocytes and saliva.** *Toxicol. Appl. Pharmacol.* 48(1): A140; 1979.

A continued search is underway for non-invasive techniques for monitoring pesticide exposures. Since saliva has been shown to contain a number of xenobiotics, it might provide a better tolerated sampling fluid than blood or urine. This investigation is to determine if a correlation exists between levels of pesticide and cholinesterase activity in plasma, erythrocytes and saliva. Anesthetized adult male Sprague-Dawley rats received 2, 4, or 8 mg/kg carbofuran or parathion by direct injection into the stomach using corn oil as the vehicle. The distribution of carbofuran or parathion and/or their metabolites in plasma, erythrocytes and saliva was monitored by GC. Cholinesterase activity was determined by the method Ellman. An apparent correlation exists between the cholinesterase activity in plasma, erythrocytes and saliva. [Abstract #280 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2209. Madhukar, B. V.; Matsumura, F.; Yang, K. H.; Peterson, R. E. (Univ. Wisconsin, Madison, WI) **Depression of ATPase activity in hepatocyte surface membranes of rats by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin treatment.** *Toxicol. Appl. Pharmacol.* 48(1): A152; 1979.

$Na+$, $K+$ ATPase and $Mg^{2}+$ ATPase activities were determined in hepatocyte surface membranes (HSM) isolated from male rats killed 2, 10, 20, and 40 days after treatment with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD, 10 or 25 μg/kg, po) or acetone/corn oil (control, po). In TCDD-treated animals a depresson in the activity of both enzymes was detected 2 days after treatment. This depression

became more pronounced at 10 and 20 days and was still present after 40 days. Na+, K+ ATPase was depressed to a similar extent by 10 and 25 μg/kg TCDD whereas Mg^2+ ATPase was reduced more by the high dose. The depression in both enzyme activities was subsequently shown not to occur secondary to decreased food and water intake and was reversed 10 days after TCDD administration (25 μg/kg) by treatment on days 6 to 9 with spironolactone (75 mg/kg/day) but not pregnenolone-16-carbonitrile (75 mg/kg/day). Preincubation of control HSM with 0.1 p*M* to 10 μ*M* TCDD for 15 min failed to inhibit ATPase activity. Thus, *in vivo* treatment with TCDD produces a delayed onset, long term depression of HSM Na+, K+ ATPase and Mg^2+ ATPase but *in vitro* treatment has no effect. [Abstract #305 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2210. Smith, E. N.; Carlson, G. P. (Dep. Pharmacol. & Toxicol., Sch. Pharm. & Pharm. Sci., Purdue Univ., West Lafayette, IN) **Pharmacokinetics of 1,2,4-tribromobenzene and 1,2,4-trichlorobenzene.** *Toxicol. Appl. Pharmacol.* 48(1): A153; 1979.

Using ^{14}C-labeled compounds the fate of 1,2,4-tribromobenzene (TBB) and 1,2,4-trichlorobenzene (TCB) in relation to the extent and duration of enzyme induction was investigated. The influence of starvation and phenobarbital in combination with the compounds was observed. Male rats received 1 m*M*/kg/day of compound po for 7 days. *p*-Nitroanisole demethylation was elevated 16 days after the last dose of TBB but not consistently for TCB. Cytochrome P-450 and cytochrome *c* reductase were also induced. The highest induction levels observed were due to 4 days of starvation after 7 days of injection and 6 days of rest. Tissue analysis showed greater retention of TBB than TCB with highest levels in the fat. More TCB than TBB was excreted in the urine, and fecal excretion was only 5 to 10% of the urinary excretion. The results demonstrate that on an equal molar basis, TBB leads to higher levels of enzyme induction which are maintained for longer periods, is retained to a greater extent in fat and is more influenced by starvation than is TCB. [Abstract #307 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2211. Cianflone, D. J.; Hewitt, W. R.; Plaa, G. L. (Dep. Pharmacol., Univ. Montreal, Montreal, Quebec, Canada) **Acute alteration of chloroform-induced hepatotoxicity by mirex and Kepone.** *Toxicol. Appl. Pharmacol.* 48(1): A156; 1979.

A challenging dose of $CHCl_3$ produced marked hepatotoxicity in Kepone (chlordecone, K) but not mirex (M) pretreated mice. This may have been due to an inability of the mirex treatment regimen to induce hepatic MFOs (mixed function oxidases) activity. Male Swiss-Webster mice received a single oral dose of M (10, 50, or 250 mg/kg) or K (50 mg/kg). After 18 hr, hepatic microsomal aminopyrene *N*-demethylase and aniline hydroxylase activity and cytochrome P450 content were determined. Both M and K induced MFO enzyme activity to an approximately equivalent degree. Thus the inability of M to potentiate $CHCl_3$-induced hepatotoxicity cannot be explained by this mechanism. Subsequently, male Sprague-Dawley rats were given M or K (10 mg/kg, po) once daily for 3 days. $CHCl_3$ (0.5 ml/kg, po) was given 18 hr after the last dose of M or K. In contrast to mice, determination of liver damage 24 hr later showed both M and K potentiated $CHCl_3$-induced liver damage. However M elicited a smaller degree of potentiation than did K. These results suggest that K, possibly as a result of its ketonic structure, possesses a greater capacity to alter $CHCl_3$-induced liver damage than dose M. [Abstract #313 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2212. Chambers, J. E.; Robinson, K. M.; Yarbrough, J. D. (Dep. Biol. Sci., Mississippi State Univ., Mississippi State, MS) **Effects of mirex and dichlorinated mirex derivatives on relative organ weights and liver chemistry in rats.** *Toxicol. Appl. Pharmacol.* 48(1): A159; 1979.

Rats were given single oral doses of mirex and dechlorinated derivatives in oil and relative liver, adrenal and gonad weights as well as selected liver chemistry parameters were determined. Mirex and some chlorinated derivatives caused an increase in relative liver and adrenal size, a decrease in relative gonad size, a deposition of lipid in the liver and gave no evidence of liver damage. No outstanding difference in pharmacological effects among the compounds was noted. With doses up to 600 mg/kg for up to 2 wk, relative (organ weight/body weight) liver and adrenal weights increased up to 100%, while relative gonad weight decreased up to 30%. Female rats which died from a given dose had greater relative adrenal weights than did survivors. Increases in relative liver weight demonstrated a dose-response relationship, whereas ovary weight decreases and adrenal weight increases did not. At 4 days following doses of up to 150 mg/kg, glutamic pyruvic transaminase (GPT) and DNA in liver homogenates were lower in treated animals; protein, dry weight and RNA were not altered, and lipid was increased 15-60%. Serum GPT appeared unchanged. [Abstract #319 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2213. Deckert, F. W.; Geyer, W.; Godfrey, W. J.; Lisk, D. C.; Steigerwalt, R. B.; Udinsky, J. R. (Rohm & Haas, Co., Spring House, PA) **Partial metabolic fate of ^{14}C-RH-787 (Vacor rodenticide) in dogs, rats and humans.** *Toxicol. Appl. Pharmacol.* 48(1): A163; 1979.

Species selectivity of RH-787 (N-3-pyridylmethyl- N′-*p*-nitrophenyl urea) seems to depend on biotransformation. These studies compared fates by Py- and NP-^{14}C-787 in rats and dogs. Human Vacor (pyriminil) metabolites were examined in poisoning cases. Although single oral 30 mg/kg doses of 787 were lethal to rats but not dogs, they produced higher blood levels in dogs. However, most ^{14}C in rat blood was due to 787, while dog blood contained primarily *p*-nitrophenyl urea. Rat urine contained large amounts of 787 while dog

urine had < 1%. Dog urine contained 40-60% unidentified polar material, but rat urine only 5-20%; this material from rats, but not dogs, was partially hydrolyzed by β-glucuronidase to 787. Other identified metabolites include amino-787, acetamido-787, *p*-aminophenyl urea, *p*-acetamidophenyl urea, *p*-nitroaniline, *p*-phenylenediamine, *p*-acetamidoaniline, nicotinic acid, nicotinuric acid and nicotinamide. Most were found in all three species, but concentrations varied. The presence of parent compound in rat and human urine suggests that they may be more sensitive to Vacor because of inefficient metabolism. Tolerance in dogs is probably due to rapid detoxication. [Abstract #327 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2214. Melancon, M. J., Jr.; Branson, D. R.; Lech, J. J. (Dep. Pharmacol., Med. Coll. Wisconsin, Milwaukee, WI) **The uptake, elimination and metabolism of 1,2,4-trichlorobenzene in rainbow trout.** *Toxicol. Appl. Pharmacol.* 48(1): A170; 1979.

The uptake and elimination kinetics and biotransformation of trichlorobenzene were studied in rainbow trout. Trout were exposed to aqueous trichlorobenzene in static systems for short term exposures and continuous flow delivery systems for longer exposures. The trichlorobenzene derived material in selected tissues was measured at various times during uptake and depuration. Trichlorobenzene derived material in selected tissues was measured at various times during intake and depuration. Trichlorobenzene derived material in bile and tissue extracts was examined by solvent partitioning and thin layer chromatography for the presence of biotransformation products. When evaluated by a computer program (BIOFAC), muscle trichlorobenzene levels from an 8 hr exposure at 0.012 μg/ml and a 35 day exposure at 0.02 μg/ml gave bioconcentration factors of approximately 100 while those from 4 day exposure at 0.001 and 0.01 μg/ml gave bioconcentraton factors of approximately 400. Bile from trout which had been exposed to 0.25 μg/ml trichlorobenzene for 24 hr contained 5 μg/ml of trichlorobenzene and 10 μg/ml of biotransformation products. Muscle and liver extracts contained 0.8% and 3.7% of biotransformation products, respectively. [Abstract #341 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2215. Carnines, E. L.; Borzelleca, J. F. (Dep. Pharmacol., Med. Coll. Virginia, Richmond, VA) **Kepone: cellular sites of action.** *Toxicol. Appl. Pharmacol.* 48(1): A174; 1979.

Kepone (chlordecone, 0.01 to 100 μ*M*) inhibited a number of basic cellular and biochemical responses. Using the P388D$_1$ cell lines, an *in vitro* cell system was developed utilizing a mosaic of parameters (ie. cell proliferation, oxygen consumption, phagocytosis, and calcium metabolism) as indicators of cytotoxicity. This cell line has been shown to possess many morphological and functional characteristics of macrophages. Kepone (0.01 to 100 μ*M*) inhibited cellular proliferation (90 to 20%) and stimulated oxygen consumption (260 to 97%). The ability of the P388D$_1$ cells to phagocytize opsonized sheep red blood cells was initially enhanced followed by a depression over a four hour treatment period. Kepone produced a significant decrease in the size of the mitochondrial exchangeable calcium pool while increasing the efflux rate constant of that pool. The effects of Kepone on energy metabolism and calcium distribution may be facets of cellular events related to the observed *in vivo* toxicity. [Abstract #349 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2216. Kuttan, R.; Spall, R.; Sipes, I. G.; Meezan, E.; Brendel, K. (Dep. Pharmacol., AHSC, Univ. Arizona, Tucson, AZ) **Effect of paraquat treatment on rat kidney basement membranes.** *Toxicol. Appl. Pharmacol.* 48(1): A177; 1979.

The herbicide paraquat (methyl-viologen) has been shown to produce severe lung fibrosis in both laboratory animals and human subjects. Its effect on the kidney has been much less studied. A method has been developed in this laboratory to produce "acellular kidneys" which depends on exhaustive extraction with detergents. The superstructure composed of basement membrane remains intact in these preparations. Using this method, changes in kidney basement membrane obtained 9 days after a single dose of paraquat (ip 25 mg/k) were studied. Electron microscopy showed numerous "spiky" protrusions in the luminal side of tubular basement membranes of the affected kidneys, while glomerular basement membrane remained intact. Chemical analysis of the damaged basement membrane showed increased levels of hydroxylysine, 3-hydroxyproline and cysteine, possibly indicating increased basement membrane synthesis. Parallel to this finding, the synthesis of collagenous proteins of the kidney was increased which was reflected by both elevated prolyl hydroxylase levels and incorporation of proline into extracellular matrix. [Abstract #355 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2217. Singh, A.; Valli, V. E.; Ackerley, C. A.; Villeneuve, D. C.; Kuiper-Goodman, T.; Ritter, L. (Univ. Guelph, Guelph, Ontario, Canada) **Ultrastructural assessment of toxicity of photomirex and mirex in the liver and testis of rat.** *Toxicol. Appl. Pharmacol.* 48(1): A183; 1979.

Although photomirex and mirex are known environmental contaminants, little is known about their toxic effects on animals. Hence, Sprague-Dawley weanling rats were fed rations containing 0, 0.05, 0.5, 5 or 50 ppm photomirex or 5 or 50 ppm mirex for 28 days. Liver and testis samples from two animals of each group were chosen and processed for electron microscopy. In animals fed 5 or 50 ppm photomirex or 50 ppm mirex many heptatocytes exhibited a proliferation of smooth endoplasmic reticulum, and a concomitant reduction of glycogen. The myoid cells of the testicular limiting membrane at 0.05 ppm photomirex depicted disorganized architecture. The occurrence of gaps among cells of seminiferous epithelium was commmon in rats receiving photomirex

or 50 ppm mirex. Nuclear inclusions were seen in differentiating spermatogenic cells of photomirex-fed rats. Sertoli cells of treated animals were frequently vacuolated. Photomirex is, therefore, more toxic to rats than mirex. [Abstract #367 of th 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2218. McConnell, E. E.; Parker, C. E.; Gupta, B. N.; Luster, M. I.; Moore, J. A. (NIEHS, Research Triangle Park, NC) **The comparative toxicity of technical and analytical pentachlorophenol in cattle.** *Toxicol. Appl. Pharmacol.* 48(1): A184; 1979.

The object of this study was to compare the effects of technical (t) vs analytical (a) grade PCP in cattle. Four groups of 3 female yearlig Holstein calves were exposed for 160 days *via* feed to aPCP or tPCP and mixtures thereof. A fifth group served as unexposed controls. All treated animals received the same amount of PCP; 20 mg/kg/day for 42 days followed by 15 mg/kg/day. Fat biopsies for chemical analyses were obtained before, during (70 days) and at the end of the study. Liver samples were collected at the latter two times. Major findings included a dose related decrease in body weight gain, decreased feed efficiency and progressive anemia in tPCP cattle while those exposed to aPCP were comparable to the untreated controls. Liver and lung weights were increased while the thymus was decreased. Marked villous hyperplasia of the urinary bladder was found in 2 of 3 animals exposed to the highest level of tPCP. There were minimal hepatic lesions. Immunological studies suggested a progressive dose related alteration in cell mediated immunity but no effect on humoral immunity. This study indicates that the toxicity of PCP in cattle is primarily attributable to its contamination with toxic impurities. [Abstract #368 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2219. Curtis, L. R.; Mehendale, H. M. (Dep. Pharmacol. & Toxicol., Univ. Mississippi Med. Cent., Jackson, MS) **Biliary excretion dysfunction in the rat following exposure to photomirex.** *Toxicol. Appl. Pharmacol.* 48(1): A186; 1979.

Exposure to 50 and 150 ppm of photomirex (PM), in the diet of male Sprague-Dawley rats for 15 days resulted in impaired biliary excretion of polar metabolites of imipramine (PMIMP) and phenolphtalein glucuronide (PG) in intact animals. Biliary excretion of PMIMP and PG was reduced 13% and 21%, respectively,, at 50 ppm PM; and 20% and 28% respectively, at 150 ppm PM. Biliary excretion of PG was also examined in 50 ppm PM. Biliary excretion of PG was also examined in 50 ppm PM rats 24 hr after an ip dose of 0.1 ml CCl_4/kg. In these animals biliary excretion of PG was reduced 40%, while CCl_4 alone reduced it by 25%. SGPT and SGOT were unaltered by either PM dose or CCl_4, while the 50 ppm PM-CCl_4 combination resulted in 8 and 7 fold increases in the respective enzyems. Hypertrophy of the liver was observed with 50 ppm PM (39% increase in liver wt), 150 ppm PM (102% increase), and 50 pm PM-CCl_4 (100% increase), while CCl_4 alone did not alter this parameter. Histologically, no necrosis but liposis was observed in the livers of rats receiving PM. Liposis and slight centrilobular necrosis was seen after CCL_4 and PM-CCl_4 resulted in considerable centrilobular necrosis. [Abstract #373 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2220. Eaton, D. L.; Klaassen, C. D. (Dep. Pharmacol., Med. Cent., Univ. Kanasa, Kansas City, KS 66103) **Alterations in hepatic transport systems in isolated rat hepatocytes after treatment with microsomal enzyme inducers.** *Toxicol. Appl. Pharmacol.* 48(1): A187; 1979.

The effects of phenobarbital (PB), 3-methylcholanthrene (3-MC), pregnenolone- 16α- carbonitrile (PCN), 2,3,7,8-tetrachlorodibenzo- *p*-dioxin (TCDD), and Kepone (chlordecone) on the hepatic uptake of ouabain and procaine amide ethobromide (PAEB) were examined in isolated rat hepatocytes. The initial velocity of uptake (Vo) for ouabain was increased to 150 and 200% of control after PB and PCN, respectively. TCDD decreased the Vo of ouabain by 50%. The Vo of PAEB was not affected by any of these compounds. Cellular concentrations of ouabain and PAEB approached steady-state levels after about 45 min. Steady-state levels of ouabain were significantly increased after treatment with PCN and 3-MC, and steady-state levels of PAEB and the bile acid taurocholate were also increased by 3-MC. TCDD and Kepone significantly depressed the steady-state levels of ouabain. Phenobarbital was the most effective inducer of cyctochrome P450 and microsomal protein and PCN was the least effective. These data demonstrate that there is no apparent relationship between the ability of xenobiotics to increase hepatic cytochrome P450 and their ability to alter hepatic carrier-mediated transport systems. [Abstract 374 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2221. Mayes, B. A.; Abraham, R. (Inst. Comp. & Hum. Toxicol., Albany Med. Coll., Albany, NY 12208) **Comparisons in hepatic response to mirex with CD-1 and $B_6C_3F_1$ mice.** *Toxicol. Appl. Pharmacol.* 48(1): A188; 1979.

Previous studies have shown that mirex causes significant changes in tetraploid and octaploid but not diploid hepatocytes in CD-1 mice. $B_6C_3F_1$ hybrid strain mice were extensively used for carcinogenic studies and it was, therefore, of interest to compare the effects of mirex in this strain. Comparisons after 2, 4 and 8 wk of dietary exposure to 15 ppm mirex indicated a greater susceptibility of the hybrid strain with increased mortality and necrosis as early as 4 wk. Coulter counter analysis of the hepatic nuclei revealed that $B_6C_3F_1$ mice had consistently increased tetraploid and octaploid volumes with decreased tetraploid frequency, while CD-1 mice changed very little. DNA synthesis increased 6-fold in hybrid and 4-fold in CD-1 mice and was most prominent in the tetraploid and octaploid cells as detected autoradiographically. These changes indicate an increased susceptibility of $B_6C_3F_1$ polyploid hepatocytes to mirex and

may also explain the resistance of rats and monkeys to these chemicals since the latter have predominantly diploid cells. [Abstract #376 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2222. Villeneuve, D. C.; Becking, G. C.; Valli, W. E. (Health Prot. Branch, Health & Welfare Canada, Ottawa, Ontario, Canada) **Photomirex: a ninety day toxicity study in rats.** *Toxicol. Appl. Pharmacol.* 48(1): A191; 1979.

Photomirex (8-monohydromirex) is a demonstrated environmental contaminant and was observed in previous short-term studies to produce lesions in the liver, thyroid and testes. The present study was undertaken to confirm these observations and to determine the effects after a longer period of exposure. Male rats were fed photomirex for 12 wk at levels of 0.20, 1.0, 5.0, 25 and 125 ppm in the diet. Deaths were observed in animals receiving the highest dose. Decreased body weight gain and food intake were also observed in that group. Liver weights were increased at 5.0 ppm photomirex and higher. Photomirex caused changes in several biochemical parameters including SDH and microsomal mixed function oxidase activity. Dose related histological abnormalities were observed in the thyroid and liver starting at the lowest dose level. Lesions of the testes were only observed at the highest dose level. These results confirm earlier findings and show that photomirex is a potent hepato- and thyrotoxin. [Abstract #383 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2223. Cabral, J. R. P.; Raitano, F.; Mollner, T.; Bronczyk, S.; Shubik, P. (Eppley Inst. Res. Cancer, UNMC, Omaha, NE) **Acute toxicity of pesticides in hamsters.** *Toxicol. Appl. Pharmacol.* 48(1): A192; 1979. (1 reference)

As part of a program designed to investigate specific differences in toxicity between rodent species it was decided to assess the susceptibility of the hamster to the acute toxicity of chlorinated hydrocarbons. Acute LD50 toxicity studies were conducted with 13 pesticides. The chemicals were administered orally by intubation to female and male, 6-wk-old, syrian golden hamsters. In select cases behavioral tests (open field) were conducted in groups of survivors before killing the animals 2 wk after starting. The LD50 was calcuated by the method of Weil. The LD50 values (mg/kg body wt) found were: atrazine, 1000; chlorobenzilate, 700; 2,4,-D, 500; dieldrin, 100; endrin, 17 in females and 12 in males; methoxychlor 2000; mirex, 125 in females and 250 in males; PCNB (quintozene) > 4000; pentachlorophenol (PCP), 168 and toxaphene, 200. When comparing the present results with data previously reported in rats it can be concluded that the hamster is as sensitive as the rat to the acute toxicity of most of the compounds studied. [Abstract #384 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2224. Glickman, A. H.; Shono, T.; Casida, J. E.; Lech, J. J. (Dep. Pharmacol., Med. Coll. Wisconsin, Milwaukee, WI) **Studies on the metabolism of permethrin by fish.** *Toxicol. Appl. Pharmacol.* 48(1): A193; 1979.

Permethrin, a pyrethroid insecticide, has been shown to be considerably more lethal to fish than to mammals. The *in vitro* metabolism of permethrin in both rainbow trout and carp was investigated to determine whether differences in biotransformation processes might play a role in the selective toxicity. *Cis* and *trans* (^{14}C) permethrin were incubated with RB trout and carp liver microsomes. Both carp and RB trout microsomes readily hydrolized the ester of the *trans* isomer of permethrin. The *cis* isomer was considerably more resistant to esterase attack and was primarily metabolized via oxidative pathways. Oxidative metabolism also occurred on the *trans* isomer but the action of the oxidases on this isomer seemed secondary to the hydrolytic activity of the esterases. Preliminary *in vivo* metabolism studies on RB trout exposed to (^{14}C) permethrin showed little parent compound remaining in the bile, the majority of ^{14}C derived permethrin being polar metabolite. The data indicate that fish are capable of metabolizing permethrin both *in vivo* and *in vitro* and the pathways appear qualitatively similar to those seen in mammals. [Abstract #386 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2225. Howark, L. C.; Owen, N. V.; Young, S. S.; Morton, D. M.; Golberg, L. (Toxicol. Div., Lilly Res. Lab., Greenfield, IN) **A two-year chronic toxicity study of tricyclazole in mice.** *Toxicol. Appl. Pharmacol.* 48(1): A194; 1979.

Tricyclazole is a fungicide effective in controlling rice blast disease. In a 3 mo subchronic toxicity study, 400 ppm increased liver weights in female mice. Higher doses (1000-3600 ppm) produced mortality, increased liver weight and SGPT, decreased body weight and caused proliferation of small bile ducts. Subsequently, a chronic toxicity-oncogenic study was initiated. ICR mice were maintained for 2 yr on diets containing 50, 140, or 400 ppm of tricyclazole (3.5-45.9 mg/kg/day). Treatment-related effects on survival, body weight, water consumption, organ weights, hematology, clinical chemistry and gross and histopathologic measurements were not observed. No variations of biological importance in the incidence of neoplasms were observed. A no effect level of 400 ppm was supported by the results of this study. [Abstract #388 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2226. Ross, J. H.; Krieger, R. I.; Lim, L. O. (Dep. Environ. Toxicol., Univ. California, Davis, CA) **Herbicidal potency of paraquat homologs as a function of their physicochemical constants in duckweed.** *Toxicol. Appl. Pharmacol.* 48(1): A194; 1979. (1 reference)

The influence of physicochemical parameters eg. redox potential (E1/2), Taft's polar inductive effect constant (σ^*), and Taft's steric factor (Es) on paraquat and its homologs (viologens) as determinants of herbicidal potency were quantitatively examined. Duckweed is a sensitive indicator of bipyridylium herbicidal activity. Ten mature duckweed plants were exposed to four concentrations of paraquat

homologs bracketing the effective chlorotic dose in 100 ml of water. Exposure time was 48 hr with continuous illumination. For comparison, the homologs were also administered subcutaneously to female Sprague-Dawley rats at concentrations bracketing the mammalian lethal dose. Herbicidally effective concentrations were 2.7, 11.6, 236, 71, 31, 51, 13 and 43 μM for methyl (paraquat), propyl, iso-propyl, butyl, methyl-pentyl, hexyl, octyl and benzyl viologen, respectively. The lowest lethal doses in rats for the same compounds were 105, 351, > 185, 125, 55, 37, 281, and 18 μM/kg. Side chains bulkier than propyl resulted in greatly decreased herbicidal potency. [Abstract #389 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2227. Abou-Donia, M. B.; Graham, D. G.; Komeil, A. A. (Dep. Pharmacol., Med. Cent., Duke Univ., Durham, NC 27710) **Delayed neutrotoxicity of *O*-ethyl *O*-2,4- dichlorophenyl phenylphosphono thioate: effects of a single oral dose on hens.** *Toxicol. Appl. Pharmacol.* 48(1): A195; 1979.

Delayed neurotoxicity was produced in hens after the administration of a single oral dose of technical (96.43%) *O* ethyl *O*-2,4- dichlorophenyl phenyl phosphonothioate (S-7) in gelatin capsule. Doses ranged from 800-5000 mg/kg. Hens given 5000 mg/kg also received atropine sulfate to protect them against acute toxicity. S-7 caused ataxia which progressed in some hens to paralysis and death, and caused loss of appetite and weight. TOCP-treated hens developed delayed neurotoxicity while those given parathion showed leg weakness, but with subsequent recovery. Atropine sulfate and gelatin capsule controls remained normal. Degeneration of axons and myelin in the spinal cord was the most consistent histologic change and was identical to that found in TOCP control hens. Only one hen showed sciatic nerve degeneration. Three groups of hens which were given a single oral dose of 100, 200, or 400 mg/kg of S-7 showed no neurologic signs of delayed neurotoxicity and their nerve tissues were not damaged. [Abstract #390 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2228. Abou-Donia, M. B.; Graham, D. G.; Reichert, B. L.; Timmons, P. (Dep. Pharmacol., Med. Cent., Duke Univ., Durham, NC 27710) **Delayed neurotoxicity of *S,S,S*-tributyl phosphorotrithioate: differences due to route of administration.** *Toxicol. Appl. Pharmacol.* 48(1): A195; 1979.

Oral administration of single oral doses of *S,S,S*-tributyl phosphorotrithioate (DEF) ranging between 100 and 1000 mg/kg caused ataxia in hens. The 100 mg/kg was the threshold single oral dose. Daily oral administration of small doses of 0.5-20 mg/kg DEF produced ataxia in hens. The daily dose of 0.1 mg/kg showed no effect. The only unequivocal histopathologic change was seen in the sciatic nerve of one of the hens given 20 mg/kg daily. On the other hand, topical administration of a single 1000 mg/kg daily doses of 40 mg/kg caused ataxis, which progressed to paralysis in some hens. Most of the topically treated hens showed axon and myelin degradation of nerve tissues. It is postulated that orally administered DEF may be rapidly metabolized in the gastrointestinal tract of the hen. The results indicate the necessity of evaluating the delayed neurotoxic effect further by topical application. [Abstract #391 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2229. Reichert, B. L.; Abou-Donia, M. B. (Dep. Pharmacol., Med. Cent., Duke Univ., Durham, NC 27710) **Inhibition of axoplasmic transport by delayed neurotoxic organophosphorus esters: a possible mode of action.** *Toxicol. Appl. Pharmacol.* 48(1): A196; 1979.

Several delayed neurotoxic insecticides were examined for antitransport activity upon fast axoplasmic transport of proteins in the rat optic nerve. These chemicals were: leptophos; DBL; EPN; cyanofenphos and S-7. TOCP and parathion were used respectively as positive and negative controls. [^{3}H]L-proline and the compound were injected into one eye and a similar solution lacking the drug was introduced into the contralateral eye. Marked inhibition of transport was observed by all insecticides and TOCP. By contrast no antitransport activity was observed with parathion. Differential antitransport activities for delayed neutoxic compounds and for parathion, are consistent with the hypothesis that these esters, act through inhibition of axonal transport. [Abstract #392 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2230. Miller, J. L.; Sandvik, L.; Sprague, G. L.; Bickford, A. A.; Castles, T. R. (Stauffer Chem. Co., Richmond, CA) **Evaluation of delayed neurotoxic potential of chronically administered dyfonate in adult hens.** *Toxicol. Appl. Pharmacol.* 48(1): A197; 1979.

Acute administration of Dyfonate (fonofos) produced mild inhibition (19%, $p < 0.05$) of hen brain neurotoxic esterase (NTE). Because inhibition of NTE activity has been related to the development of delayed neurotoxicity in hens, the neurotoxic potential of chronically administered Dyfonate was studied in this species. Separate groups of 10 adult hens received either no treatment, or 90 daily oral doses of corn oil (1 ml/kg), tri- *o*-tolyl phosphate (TOTP, 60 mg/kg), or technical Dyfonate (2, 4, or 8 mg/kg). Dyfonate produced signs of acetylcholinesterase inhibition which usually subsided within 4-5 hr after treatment. TOTP produced signs of delayed neutrotoxicity, (paralysis) that appeared by day 10 and progressed to death or cachexia within 31 days. Histologic examination revealed retrograde axonal degradation in sciatic nerves and spinal cords of TOTP-treated hens. There was no treatmentlated neuropathy in the Dyfonate-treated hens, indicating that chronic Dyfonate treatment did not produce delayed neurotoxicity. [Abstract #395 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2231. Lotti, M.; Johnson, M. K. (Toxicol. Unit., Med. Res. Council, Carshalton, Surrey, England) **Organophos-**

phate neurotoxicity: neurotoxic esterase in human nervous tissue. *Toxicol. Appl. Pharmacol.* 48(1): A198; 1979.

Neurotoxic esterase (NTE) has been recognized as the target enzyme for organophosphorus compounds causing delayed neurotoxicity in hens. We have now characterized NTE of human nervous tissue. The activity in whole brain is similar to that for hens. The distribution of NTE among many defined areas of human brain differs from that of acetylcholinesterase. AChE was greatest in the nucleus caudatus. NTE activity was greatest in all the cortical areas, less in cerebellum (one half) and in spinal cord (one third). With improved assay procedures NTE was clearly detectable (approximately 50 nmol/min /g wet wt) in human femoral nerve. This agrees with previous observations on sheep sciatic nerve. [Abstract #396 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2232. Dudek, B. R.; Barth, M.; Gephart, L.; Huggins, J.; Richardson, R. J. (Toxicol. Res. Lab., Dep. Environ. & Ind. Health, Sch. Public Health, Univ. Michigan, Ann Arbor, MI) **Correlation of brain and lymphocyte neurotoxic esterase inhibition in the adult hen following dosing with neurotoxic compounds.** *Toxicol. Appl. Pharmacol.* 48(1): A198; 1979.

Neurotoxic esterase (NTE) in brain and spinal cord of adult hens is selectively inhibited by neurotoxic organophosphorus compounds. The recent finding of NTE in lymphocytes present the possibility of utilizing these cells as an accessible monitor of NTE inhibition in nervous tissue after exposure to neurotoxic organophosphorus compounds. Dose-response curves for inhibition of NTE in peripheral blood lymphocytes and brain were determined 24 hr after administration of 0, 5, 15, 35, 65, 100, and 200 mg/kg of TOTP (tri- *o*-cresyl phosphate) to adult hens. Mean % inhibiton in lymphocytes was 0.0, 5.7, 37.9, 51.4, 67.6, 64.7, and 92.1, and in brain was 0.0, 14.9, 25.5, 57,6, 80,4, 80,1, an 88.3, respectively. These data, combined with values obtained using the neurotoxic compounds EPN, leptophos, and DFP, yielded a correlation coefficient of 0.88 for a plot of brain versus lymphocyte NTE inhibition. These results suggest that NTE inhibition in lymphocytes could be used to measure exposure to neurotoxic organophosphorus compounds and to predict potential neurotoxic hazard. [Abstract #397 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2233. McDonald, T. O.; Fingerman, M. (Dep. Biol., Tulane Univ., New Orleans, LA 70118) **Effects of DDT and parathion on goldfish retina/pigment epithium/choroid concentrations of serotonin, dopamine and norepinephrine.** *Toxicol. Appl. Pharmacol.* 48(1): A199; 1979.

5-HT, DA and NE were assayed spectrofluoro metrically. Fish were maintained at 15°C in a closed environmental chamber and on a 12 hr light/12 hr dark cycle. Treated fish were sacrificed by decapitation 5 hr into the light cycle. 5-HT, DA and NE levels showed a circadian rhythmicity with one major peak and one secondary peak each day. Peak values were 2.35 and 2.15 μg/mg wet tissue at 8 hr light and 11 hr dark, respectively, for NE. For DA, they were 22 and 12 μg/mg wet tissue at 5 hr light and 8 hr dark, respectively. 5-HT concentrations were 8.25 and 5.70 μg/mg wet tissue at 11 hr light and 11 hr dark, respectivly. Twenty-four hr after ip injection DDT (50 mg/kg) elevated 5-HT (200%), NE (30%), and DA (20%). Parathion (100 mg/kg) had no effect on 5-HT and DA but it reduced NE 40%. DDT and parathion produce disoriented behavioral changes in fish which may be related to their effects on these neurotransmitters in the retina/pigment epithelium/choroid was well as to their induced changes in brain neurotransmitters. [Abstract #398 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2234. Gray, L. E., Jr.; Kavlock, R.; Chernoff, N.; Lawton, D.; Gray, J. (Health Eff. Res. Lab., US EPA, Research Triangle Park, NC 27711) **The effects of endrin administration during gestation on the behavior of the golden hamster.** *Toxicol. Appl. Pharmacol.* 48(1): A200; 1979.

Golden hamsters (*Mesocricetus auratus*) were intubated with endrin (0.75 and 1.5 mg/kg) on day 5-14 of gestation. The reactive locomotor activity and rearing behaviors of the dams were observed for 5 min in an open-field throughout gestation and at weaning. Endrin-treated dams were significantly less active ($p < .01$) than were controls during gestation but not at weaning. The offspring of these dams were tested in the openfield (5 min.) at 15, 20, 27, 34 and 44 days of age. Fifteen day old pups at the 1.5 mg/kg dose were approximately 90% more active than were controls. This difference disappeared by 34 days of age. The results of the present study demonstrate that prenatal endrin exposure has potent behavioral effects in dams and their offspring. [Abstract 401 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2235. Chernoff, N.; Kavlock, R. J.; Gray, L. E.; Hanisch, R. C. (Health Eff. Res. Lab., US EPA, Research Triangle Park, NC 27711) **Teratogenic effects of endrin in the gold hamster.** *Toxicol. Appl. Pharmacol.* 48(1): A201; 1979. (1 reference)

Endrin is a cyclodiene insecticide used for the control of cotton pests. Previous work indicated that a single oral dose of endrin administered on day 8 of gestation induced fetal toxicity in hamsters. The experiments presently reported compared the effects of a single oral dose (maximum 10.0 mg/kg) administered on day 8, with effects of multiple dosing on days 5-14 (maximum 3.5 mg/kg/day). The single dose experiments produced no changes in maternal lethality or weight gain. No compound-related differences were noted in % fetal death or fetal weight. Significant incidences of fused ribs and meningo encephaloceles were seen at doses of 5 mg/kg/day or greater. The multiple dose regimen elicited different responses. Maternal lethality and weight loss occurred at doses of 1.5 mg/kg/day or greater. Significant dose-related increases in fetal mortality and decreases in fetal weight were noted at these dose-levels. The occurrence of

defects was lower and the few meningo encephaloceles seen occurred only in the 1.5 mg/kg/day dose group. [Abstract #402 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

79-2236. Abou-Donia, M. B.; Graham, D. G.; Komeil, A. A.; Timmons, P. (Dep. Pharmacol., Med. Cent., Duke Univ., Durham, NC 27710) **Delayed neurotoxicity of leptophos: effect of pure, technical grade and degradation products on the hen.** *Toxicol. Appl. Pharmacol.* 48(1): A206; 1979.

Pure and technical grade leptophos (*O*-methyl *O*-4-bromo- 2,5,-dichloro phenyl phenylphosphono thioate) and some of its degradation products were screened for delayed neurotoxicity following daily oral administration of 10 mg/kg dose to hens. The chemicals were: *O*-methyl *O*-2,5-dichloro phenyl phenylphosphono thioate (DBL); *O*-methyl *O*-4-bromo-2,5-dichloro- phenyl phenylphosphonate (leptophos oxon); phenylphosphonic acid (PPA) and 4-bromo- 2,5-dichlorophenol (BDCP). All hens given pure and technical grade leptophos, DBL and leptophos oxon developed ataxia which progressed to paralysis and death in some hens. Histologic examination showed in most hens marked axon and myelin degeneration in the sciatic nerve and spinal cord. By contrast no delayed neurotoxicity was produced in hens given PPA or BDCP. TOCP-treated hens developed delayed neurotoxicity while those given parathion showed leg weakness, but with subsequent recovery. Gelatin capsule controls remained normal. [Abstract #412 of the 1979 annual meeting of the Society of Toxicology.] (Author abstract by permission)

See also 79-2001, 79-2002, 79-2003, 79-2004, 79-2007, 79-2009, 79-2010, 79-2013, 79-2015, 79-2016, 79-2017, 79-2018, 79-2019, 79-2020, 79-2022, 79-2024, 79-2027, 79-2040, 79-2044, 79-2079, 79-2086, 79-2088, 79-2090, 79-2238, *and* 79-2248.

79-2237. Guardino, X.; Bartual, J.; Berenguer, J. (Dep. Hig., Inst. Territorial Hyg. & Seguridad Trabajo Barcelona, Barcelona, 34, Spain) **Determination de pesticides en aire. Captacino en un adsorbente solido y analysis por cromatografia de gases utilizando detetores especificos. [Estimation of pesticides in air. Adsorption in a solid and analysis by gas chromatography using specific detectors.]** *Afinidad* 359(36): 9-14; 1979. (5 references) (Spanish)

The various steps in the establishment of a method for the determination of pesticides in the air, especially in work environments are described. The compounds studied were lindane, diazinon and Vapona (dichlorvos). After adsorption over Chromosorb 102, the samples were analyzed in a gas chromatograph equipped with specific detectors. The electron capture detector served for lindane and Vapona. For diazinon, the flame photometry method with phosphorus filter proved more suitable. Detection limits for the three pesticides were calculated. The lineal work margins obtained with each product are also given. The median values achieved fr the adsorption-desorption efficiencies ranged from 70 to 96%. Diazinon accounted for the lower percentages. A discussion of the solvent's influence on the adsorption-desorption efficiency is also included.

79-2238. Crookshank, H. R.; Palmer, J. S. (Vet. Toxicol. & Entomol. Res. Lab., Sci. & Educ. Adm., USDA, College Station, TX 77840) **Comparison of two procedures of determination of cholinesterase in livestock.** *Clin. Toxicol.* 13(5): 557-566; 1978. (4 references)

Data indicate that the serum or plasma Bio-Dynamics/bmc automated procedure may be substituted satisfactorily for, or used as an alternative method to the Redeleff procedure for determining cholinesterase activity in cattle, swine, and sheep. The automated procedure is capable of 77 determinations/hr, and the Radeleff procedure about 20/hr. Either serum or plasma may be used, but the sample must not be hemolyzed. (Author abstract by permission)

79-2239. Baida, T. A. (Kazakh Res. Inst. Plant Prot., Alma-Ata, USSR) **Opredelenie tsianoksa metodum khromatografii v tonkom sloe. [Determination of cyanox by chromatography in thin layer.]** *Gig. Sanit* 44(3): 47-48; 1979. (Russian)

Thin layer chromatography was employed for determination of the organophosphorus insecticide Cyanox (*O,O* dimethyl- *O*-4-cyanophenyl triophosphate, cyanophos) in plant samples. The best results were obtained with the use of carbon tetrachloride as an extracting agent (83.0-90% extraction) and hexane:acetone (2:1) as a solvent (minimal detectable amount of insecticide was 0.5 μg). Cyanox was developed as a light brown spot with an R*f* of 0.53-0.59.

79-2240. Kiril'chuk, P. P.; Kofanov, V. I. (Reg. Sanit. Epidemiol. Stn., Zhitomir, USSR) **Sovmestnoe opredelemie metilmerkaptofosa fosfamida v ob'ektakh vneshnei sredy i produktakh khmelevodstva. [Combined determination of methylmercaptophos and phosphamide in environmental materials and products of hop growing.]** *Gig. Sanit.* 44(4): 53-55; 1979. (2 references) (Russian)

An assay for combined determination of residues of methylmercaptophos (demeton-*O*-methyl) and phosphamide in soil, hop plants and beer is described. The assay is based on the different solubility of insecticide (methylmercaptophos is readily soluble in water, while phosphamide is soluble only in the organic solvents). The insecticides are extracted with diethyl ether and the ether extract is concentrated by evaporation, purified and separated by liquid chromatography. The detectability of the assay ranged from 75% to 90-95%.

79-2241. Klisenko, M. A.; Kiseleva, N. I.; Kokarovtseva, M. G. (Inst. Hyg. & Toxicol. Pestic. Polym. & Plastics, Kiev, USSR) **Gazokhromatograficheskii metod opredeleniia etilenkhlorgidrina (khloretanola) v krovi i pecheni teplokrovnykh zhivotnykh (krys). [Gas chromatographic method of determination of ethylenechlorohydrine (chlorethanol) in** blood and liver of warm blooded animals (rats).] *Gig. Tr. Prof. Zabol.* (3): 54-55; 1979. (4 references) (Russian)

A gas chromatographic method of determination of chlorethanol (1-bhydroxy-2-chlorethanol) in the presence of 1,2-dichloroethane (ethylene dichloride) is described. The samples of blood (15-18 ml) and liver (20-25 g) were obtained from rats that were exposed to chlorethanol at LD50 (80 mg/kg, ig). The samples were extracted with *n*-hexane, purified and diluted. The minimum detectable amount of chlorethanol was 0.2 μg. The sensitivity of the assay was 1.5-2.0 μg/ml for blood and 3.5-4.0 μg/g for the liver.

79-2242. Villa, P,; Sciarra, M.; Piersanti, S. (Ist. Ig., Univ. Cattol. Sacro Cuore, Rome, Italy) **Analisi della sodio azide nel vino mediante diffusione su metaemoglobina. [Evaluation** of sodium azide in wine by means of diffusion on methemoglobin. First note. Choice of operating conditions.] *Ig. Mod.* 72(3): 321-335; 1979. (63 references) (Italian)

A quantitative methemoglobin diffusion method for determining sodium azide in wine which, because of its toxicity to bacteria, interferes with proper fermentation is described: 10 ml wine, acidified with 2 ml 1N H_2SO_4 is introduced into a Widmark apparatus whose beaker contains 5 ml MHb; the apparatus is kept at 45°C in a thermostat for 1 hr whereafter the optical density of MHb is read on a spectrophotometer at 572 and 700 nm and the difference is plotted on a diagram with a NaN_3 scale from 0-3 mg/l which yields directly the concentration sought. The method eliminates distillation.

79-2243. Babaev, I. I.; Baratov, K. B. (Tadzhik Res. Inst. Epidemiol. & Hyg., Tadzhik, USSR) **Universal'nyi metod opredeleniia gerbitsidov triazinovogo riada: prometrina, atrazina, simazina i kretazina. [Universal method for determining the triazine herbicides: prometryne, atrazine, simazine and kretazine.]** *Izv. Akad. Nauk. Tadzh. SSR Otd. Biol. Nauk.* (3): 94-97; 1978. (8 references) (Russian)

A universal method of determining triazine herbicides in plants, water and soil is described. The technique consists of extraction of herbicide residues with organic solvents and subsequent chromatography in thin layer of aluminum oxide. Percent detectability of herbicides in samples of carrot, water and soil was 94.7-98.5% for prometryne, 90-96% for atrazine, 84-92.7% for simazine, and 88-96.7% for kretazine. The sensitivity of the assay was 1 μg for prometryne and atrazine and 5 μg for simazine and kretazine.

79-2244. Matisova, E.; Krupcik, J.; Liska, O. (Chem. Fac., Dep. Anal. Chem., Slovak Tech. Univ., CS88037, Bratislava, Czechoslovakia) **Quantitative analysis of *S*-triazine herbicides by glass capillary column gas-liquid chromatography.** *J. Chromatogr.* 173(1): 139-146; 1979. (31 references)

The quantitative analysis of *s*-triazines in model mixtures and real samples was performed on a glass capillary column, which is convenient for multi-component analyses, with Carbowax 20M as stationary, with two detection systems, *viz.*, a flame-ionization detector (FID and an alkali flame detector (AFD). The range of linear response of both the FID (the range studied was 10-2000 ng of six *s*-triazines) and the AFD (the range studied was 1-200 ng of four *s*-triazines) was determined. Analytical curves were evaluated by linear regression. The limit of detection (amount which gives a peak equivalent to three times the baseline noise) of injected standards was found to be 5-10 ng of *s*-triazines with an inlet splitting ratio of 1:90 for the FID and 50-70 pg for the AFD at an inlet splitting ratio of 1:20. By comparing the results of quantitative analyses on glass capillary columns and packed columns it was determined that the same results could be obtained on both, but on the former it is possible to analyze quantitatively multi-component residues of *s*-triazines in environmental samples. (Author abstract by permission)

79-2245. Keck, H.; Kuchen, W. (Inst. Anorg. Chem. & Strukturchem. I, Univ. Duesseldorf, Duesseldorf,) **Messenspektrometrische Untersuchungen an Organophosphorverbindungen. I. Zum Massenspektrometrischen Fragmentierungsverhalten von Dithio- und Thiophosphonsaeureanhydrin.** [Mass spectrometric study on organophosphorus compounds. I. Mass spectrometric fragmentation of dithio- and thiophosphonic acid anhydride.] *Phosphorus Sulfur*4(21): 173-178; 1978. (22 references) (German)

Mass spectra of dimeric methyl, phenyl, *p*-methoxyphenyl, *p*-ethoxyphenol, 2-thionyl and 2-naphthyl, dithiophosphonic acid anhydrides [RP(S)S] and of methyl-, phenyl and cyclohexyl trimeric thiophosphonic acid anhydrides $(RP/S/O)_3$ obtained by the 311 A model mass spectrometer using 70 eV electron impact are discussed and general fragmentation patterns consistent with the metastable spectra according to the DADI method are proposed for both classes of compounds. Molecular ions are observed in all cases. While in the first group of compounds ring fission, followed by the migration of the R substitutent from P to S was the dominant decomposition sequence, in the latter group of compounds the -P-O-P- ring seems to be rather stable.

79-2246. Rodgers, M. A. (Cent. Fast Kinet. Res., Univ. Texas, Austin, TX 78712) **Laser photolysis studies of the reduction of paraquat cations in methanol.** *Photochem. Photobiol.* 29(5): 1031-1033; 1979. (12 references)

A laser photolysis apparatus was used to investigate the results of photoexcitation of paraquat cations ($PQ+^2$) in methanol solution. Paraquat solutions in methano in a 5 mm quartz cuvette were excited by pulses of 337 nm light from an N_2-gas laser. Transient optical absorptions were observed with a kinetic spectrometer utilizing a monochromator and a photomultiplier tube using 5 dynodes for amplification. Signal waveforms were processed with converters which were on-line to a computer array with a graphics terminal. The whole flash photolysis experiment was controlled from the computer terminal. This included sample changing, wavelength settings, shutter openings, laser pulsing, digitizer triggering and waveform read. The formation of the monoreduced species PQ+ was shown to occur in two processes. The first process was too fast to be resolved from the laser pulse, but the second shows first order kinetics with an observed rate constant which is linearly dependent on the paraquat concentration.

79-2247. Proudfoot, A. T.; Prestcott, L. F. (R. Infirm. Edinburgh, Edinburgh, Scotland) **Paraquat poisoning-the value of emergency paraquat estimations.** *Scott. Med. J.* 24(2): 176; 1979.

Because of the high mortality of paraquat in poisoning cases, victims have often been subjected to potentially hazardous, expensive, and unpleasant treatments in attempts to reduce absorption and increase elimination of the poison. The lack of a practical method for measurement of plasma paraquat concentration to assess the damages caused and to prescribe a suitable treatment has caused these time-consuming and often painful treatments to take place. A radio immunoassay and a micro- colorimetric method are now available for diagnosing the concentration of paraquat in plasma within 30 min. The effectiveness of various methods of treatment can then be calculated with the knowledge of plasma levels of paraquat and the time since ingestion. Methods of treating paraquat poisoning may be of value to only a few cases, but may help the physician to distinguish between patients that may benefit from emergency measures and patients that need not suffer the added burden of therapy because they are beyond help.

79-2248. Hendrickson, L. L.; Keeney, D. R. (Dep. Soil Sci., Univ. Wisconsin, Madison, WI 53706) **A bioassay to determine the effect of organic matter and pH on the effectiveness of Nitrapyrin (N-Serve) as a nitrification inhibitor.** *Soil Biol. Biochem.* 11(1): 51-55; 1979. (14 references)

A bioassay technique was developed to evaluate the effect of soil properties on nitrapyrin (NI) bioactivity. The

technique was then used to examine the effects of organic matter additions and soil pH on nitrification inhibition by NI. A 40 g sample of soil was placed in a 250 ml glass bottle and treated with a loam solution containing 2 mg N as $(NH_4)_2HPO_4$. The bottles were placed in a constant temperature cabinet at 30°C and 90% relative humidity until all of the added NH_4^+-N had been nitrified. The soil samples was then treated with water or an aqueous NI solution, and incubation. An additional 0.5 ml of solution containing 12 mg N was added to three bottles of each treatment 0, 7, 14, 21 or 28 days after addition of NI. One bottle from each treatment was then removed from the incubator 4, 8 and 12 days after addition of the NH_4^+ solution. After the incubation, the samples were extracted with 150 ml of 2 *M* KCl and analyzed for NH_4^+-N and (NO_3^- plus NO_2^-)- N by steam distillation. The nitrification rate was determined by regression analysis of the NO_3^--N present at 0, 4, 8 and 12 days following each of the NH_4^+ additions. The sorption of NI was found to decrease the effectiveness of NI in organic soils. Loss of NI by volatilization also decreased its effectiveness, while the relative inhibition by NI was found to increase as soil pH increased.

79-2249. Bazhenova, L. N.; Kirichenko, V. E.; Pashkevich, K. I. (Inst. Chem., Ural Res. Cent., Sverdlovsk, USSR) **Ekstraktsiia fenilmochevinnykh gerbitsidov organicheskimi rastvoriteliami iz vodnykh sred. [Extraction of phenylurea herbicides from aqueous media by organic solvents.]** *Zh. Anal. Khim.* 34(3): 554-556; 1979. (6 references) (Russian)

The coefficients of distribution of a series of phenylurea herbicides [fenuron, Kotoran, monuron, diuron, monolinuron, linuron, Patoran (metobromuron), Maloran (chlorbromuron), Tenoran (chloroxuron)] between the water and organic solvents were determined. Of three solvents tested, the greatest capacity to extract phenylureas was recorded for chloroform, the least for hexane with benzene in between.

79-2250. Glezer, V. T.; Stradyn', Ya. P. (Inst. Org. Synth. Riga, USSR) **Ekstraktsiono-fotometricheskoe opredelenie gerbitsida fenazona (1-fenil-4-amino-5-khlorpiridazona-6) v technicheskom produkte. [Extraction-photometric determination of herbicide phenazon (1-phenyl-4-amino-5-chloropyridazone-6) in technical product.]** *Zh. Anal. Khim.* 34(4): 615-617; 1979. (7 references) (Russian)

A new express method of determination of active ingredient of the herbicide Phenazon (chloridazon, pyrazon, 1-phenyl-4-amino-5- chlorpyridazone-6) in the technical product that contains also its isomer (compound II) and semiproduct 1-phenyl-4,5-dichloropyridazone (compound III) is described. The assay consists of preliminary extraction of impurities with chlorobenzene with subsequent spectrophotometric determination of compounds I, II and III at 285 nm in the aqueous phase. The accuracy of the assay was compatible with that of thin layer chromatography.

See also 79-2001, 79-2006, 79-2044, 79-2072 *and* 79-2232.

PESTICIDES ABSTRACTS

QUARTERLY INDEX

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PREFACE

The basic design for this index was supplied by the Technical Services Division, Office of Pesticide Programs, Environmental Protection Agency. It consists of two subject indexes (concept and compound) and two author indexes (personal and corporate). Primary and secondary headings in the Concept Index appear as subordinate headings in the Compound Index, both indexes having three levels of specificity.

In the Concept Index, only general aspects are indexed under the broader terms shown below. For specific terms, the reader should consult the appropriate heading in the Concept Index, selecting the narrower term that best fits his need.

Compounds are indexed by their common names; where other designations are used by authors, these synonyms appear with the notation to *see* the common name. Articles referring, in general, to structural or functional chemical classes are indexed under the broader headings (e.g., organochlorines, herbicides, etc.).

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